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Original Communications

OVARIAN HYPOFUNCTION, HABITUALLY DELAYED AND SCANTY MENSTRUATION, IN RELATION TO STERILITY AND LOWERED FERTILITY

A CLINICAL AND STATISTICAL STUDY*

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(Associate Gynecologist, Mt. Sinai Hospital)

HABITUAL delay of the menses has recently come to be recognized as a symptom of menstrual abnormality for which patients seek relief more frequently than heretofore. Although prolonged absence of menstruation has been generally regarded as a symptom of poor health, it did not cause women to seek medical advice as often as for menorrhagia or metrorrhagia. As long as the menses maintained some periodicity, patients did not mind their infrequent occurrence. Girls of school and college age even welcomed this tardiness because it enabled them to indulge more fully in sports, dancing, etc. They were, however, more apt to be disturbed by associated symptoms, such as increasing obesity, lassitude, mental torpor, headache—occasionally by hot flushes.

Married women whose menses are delayed or diminished find that they are not as susceptible to conception as those who menstruate normally. After several years of married life they regard themselves as sterile. Sterility then assumes major importance, the delayed periods being of secondary interest.

*From the Gynecological Service of Mt. Sinai Hospital and my private practice.

Read by title at the Fifty-fourth Annual Meeting of the American Gynecological Society, Old Point Comfort, Va., May 20-22, 1929.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

GENERAL CONSIDERATIONS BEARING UPON THE RELATIONSHIP BETWEEN
 OVARIAN FUNCTION AND MENSTRUATION. DEPENDENCE OF
 MENSTRUATION UPON OVARIAN FUNCTION

* * * * *

The most significant recent contribution bearing upon the relationship between ovulation and menstruation is to be found in Corner's work in mature females of the *macacus-rhesus* family.¹ He was able to show that in this monkey family menstruation frequently occurs without ovulation. However, when ovulation occurs it seems to take place at a definite time, about twelve or fourteen days before the onset of the menstruation. Menstruation without ovulation is not preceded by the so-called premenstrual changes of the endometrium which occur only after the formation of the corpus luteum. He found evidence of ovulation in 7 out of 27 cycles of menstruation where the data were obtained and known either through autopsy or exploration.

Whether or not we may conclude a similar relationship between menstruation and ovulation in the human species, one fact appears to be firmly established, namely, that the ovarian changes are primary and the uterine changes secondary. If Corner's observations in the monkey should hold for the human species, it would enable us to explain why any woman who has conceived once or twice may not readily conceive again, all other factors of course being excluded. It would also explain why some women are susceptible at some seasons of the year or at certain times, whereas at other times and for varying intervals they remain infertile. It would further indicate the possibility that the endometrium does not regularly undergo the typical fully developed pregravid changes with each menstrual cycle that under normal physiologic circumstances prepare the uterus for ovular nidation.

It is not illogical to assume that the menstruation which is not preceded by ovulation is also associated with an atypical, ill-developed uterine mucosa, and that the type of menses in such instance would in all probability be altered. This is of course hypothetical and observations in human material "in the light of the new facts discovered in a related species" are much to be desired, according to Corner.

In the light of Corner's findings and of clinical experience, we cannot escape the conclusion that the average woman who menstruates regularly is not capable of being impregnated each month; that therefore, her chances for conception are perhaps thus reduced to once in several menstrual cycles. Consequently, women who menstruate less frequently than once in four weeks, all other factors being equal, may be expected to have proportionately less available ripe or fertile ova than those who menstruate every twenty-eight days.

NOTE: For lack of space certain parts of this paper have been omitted. The paper will be published in full in the current volume of the Society's Transactions (1929) as well as in the author's reprints.

WHAT IS THE UNDERLYING HISTOPATHOLOGY OF THE OVARIES IN CASES OF DELAYED MENSES?

Data with respect to the anatomic condition of the ovaries in cases of scanty menstruation are unfortunately not available. The same holds true for habitually delayed menstruation.

Unless there is present some abnormality, such as fibroids, ovarian cysts, etc., indicating the need of a laparotomy, these patients are seldom operated upon, so that observations upon the ovaries are rare and perhaps unrecorded. Inasmuch as ovarian removal is certainly not warranted the opportunity for histologic examination of the ovaries is not at hand. C. Jeff Miller in a critical review of the treatment of sterility by roentgen ray therapy² mentions a case of Heimann's which was subjected to x-ray irradiation. Heimann studied the ovary, which was removed later during laparotomy for other reasons, and found both macroscopically and microscopically that its variations from normal were so slight as to be negligible. This incidentally proved the harmlessness of fractional x-ray treatment for amenorrhea.

I have had an opportunity of examining the ovaries in two cases of habitual amenorrhea. In one patient macroscopic inspection as well as microscopic study of the ovaries was possible. This patient, twenty-two years old, had been married four years, having given birth to one child ten months previously. Her menses began at the age of thirteen, and were always delayed, one, two or three months; bleeding often lasted eight days. Examination showed the uterus to be globular, in anterior position, not enlarged; the cervix was small and the adnexa were not palpable. On February 8, 1922, on account of a seizure of severe lower abdominal cramps, spotting after a delayed period, and three attacks of syncope, a laparotomy was performed. The pelvic peritoneal cavity contained a few ounces of dark blood. The tubes oozed blood. There was no evidence of an ectopic pregnancy. *The ovaries were found to be microcystic*, enlarged at least twice the normal size. They were partially resected; a portion $4\frac{1}{4}$ cm. by 2 cm. by $1\frac{1}{4}$ cm. from the right ovary and one $5\frac{1}{4}$ cm. by $2\frac{1}{2}$ cm. by 2 cm. from the left ovary were removed. The ovarian surface was absolutely smooth and pale. Here and there small cysts the size of a pea shimmered through the surface. (See illustrations.)

Microscopic examination showed a conspicuous absence of a fresh corpus luteum or of recent corpora lutea and of maturing follicles. One corpus luteum in marked regression (corpus albicans) was seen. Two smaller hyalinized bodies were present in the same ovary. There were relatively few primordial ova and even less primordial follicles. A few follicle cysts, one of which showed a well-marked theca lutein lining, were seen. The tunica albuginea was thickened and hyaline. The other ovary showed larger follicle cysts, few primordial ova and follicles, and no corpora lutea or maturing follicles.

In the other case the ovaries were inspected at the laparotomy operation for cesarean delivery. This was a woman forty years old whose menses began at the age of fourteen and were always irregular, being delayed three, four or five months. Between the ages of eighteen and nineteen amenorrhea which lasted almost two years had its beginning.



Fig. 1-A.



Fig. 1-B.

Fig. 1-A. and B.—Sagittal and transverse sections of right ovary. A corpus albicans is present.

The ovaries were flattened out, elongated, and enlarged. The surface was smooth and here and there were bluish-tinged cysts not projecting through the cortex. The appearance, however, was not unlike that of ovaries seen in pregnancy at term. The ovaries were not removed.

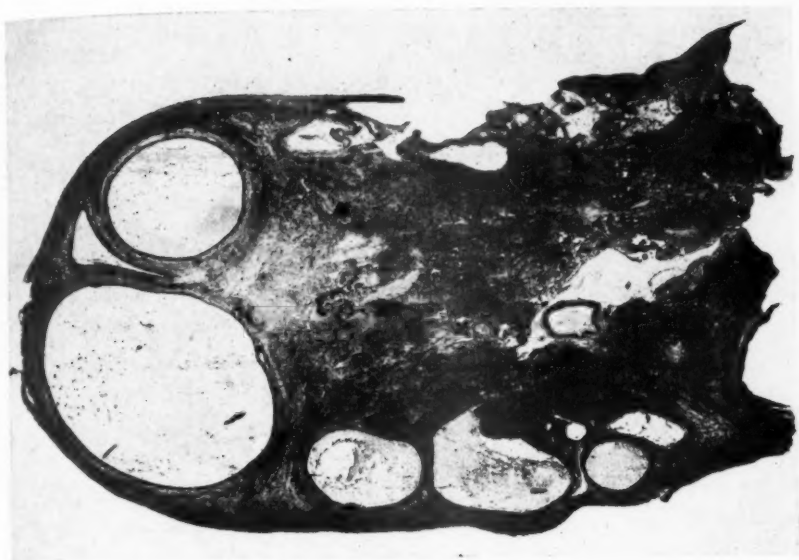


Fig. 2-A.



Fig. 2-B.

Fig. 2-A and B.—Left ovary. Follicle cysts are more numerous than in the right ovary. Theca lutein proliferation in centrally located follicle. No corpus luteum in any stage of development or regression.

This patient had been married nine and one-half years before she became pregnant. She had been treated for sterility with various gland extracts but had not been subjected to x-ray treatment.

* * * * *

Owing to the scarcity in anatomic material, we are forced to assume what the changes in the ovaries may be. However, the law of cause and effect operates so uniformly with respect to primary changes in the ovary and secondary resultant changes in the uterus that we may get an idea of the former by observing the latter.

In cases of anticipated menses and menses of the twenty-one- or twenty-two-day type Schroeder found a definite acceleration and shortening of the various phases of the endometrial cycle. The ripe ovum dies prematurely; the granulosa gland as well as the endometrium degenerates prematurely, terminating in menstruation within three weeks instead of four. In the few cases of prolonged menstrual cycle which Schroeder examined, he found that the time of ovulation was postponed with a corresponding shortening of the corpus luteum and secretory phases, i.e., of the phase of the ripe ovum. There was at the same time a lengthening of the duration and onset of the follicle ripening phase. These observations, Schroeder remarks, cannot be relied upon, however, as they have not been substantiated by a sufficient number of well-controlled cases.

If there are no data with regard to the anatomic (morphologic) changes in the ovaries, there are fortunately some data as to the status of the endometrium in these cases of amenorrhea observed during the World War.⁴ Histologic examinations of the uterine mucosa in women suffering from amenorrhea in the postwar period were made by J. Novak. He found that malnutrition causes definite changes in the genitals, varying from mild to more advanced types. In some patients there was a cyclical change of the uterine mucosa to a certain extent, without reaching the full premenstrual development. In other cases there was no evidence of any cyclical change, but at the same time, however, no marked regression. Here the mucosa was found to be in the resting stage. In a third group of patients it was more or less atrophic. That these different mucosal pictures indicate parallel ovarian changes must be assumed. In the majority of these cases there was restoration of function. In some, menstruation failed to return. These changes were also found associated with diabetes, severe gastrointestinal diseases, and other conditions which caused undernutrition.

Persistent corpus luteum has been found in some cases of temporary amenorrhea; in a few cases a polymicrocystic condition. The latter is more commonly found in instances of functional metrorrhagia. Not a small proportion of the patients with delayed menses gave a history of frequent uterine bleeding.

Another way in which some idea of ovarian function and hypofunction can be obtained is offered by investigating the female sex hormone content of the blood or urine. Frank and Goldberger have examined some 50 patients with amenorrhea. They found three types of conditions:

1. A regular subthreshold blood cycle.
2. No blood cycle.
3. An irregular, occasional blood cycle. They are therefore inclined to base their prognoses on these findings.⁵

Finally, still another method may be found in the behavior of tubal peristalsis during uterotubal insufflation. The effect upon the tubal musculature of ovarian hormone has been demonstrated to vary with the phase of the menstrual ovarian cycle.⁶

OVULAR AND FOLLICULAR CONTENT OF THE OVARIES AND FACTORS THAT INFLUENCE FOLLICLE DESTRUCTION

* * * * *

Destruction of follicles apparently goes on under normal conditions from birth to puberty. The speed of destruction probably depends upon the general constitution of the individual, her environment, hygienic conditions, mental and physical exertion and strain, especially of school studies, and the psychic predisposition. Intercurrent diseases with their complications, malnutrition, avitaminosis, low caloric diets (as witnessed in the war zones abroad) as other factors. Toxic states induce more rapid destruction of follicles, impairing the vitality of those that would under normal circumstances ripen into the typical graafian follicle and eventually into corpora lutea.

Acute infectious diseases, such as typhoid, typhus, influenza, and erysipelas, may initiate an amenorrhea of shorter or longer duration. Lues and malaria through the ravages on nutrition may produce the same result. Mumps is a well-known cause. Pulmonary tuberculosis is frequently associated with amenorrhea. In this condition it is said to be a benign symptom. It is present frequently in genital tuberculosis and may be the only sign suggestive of this infection.

In the group of depressed menstrual disorders discussed at present we exclude tumors of the ovaries and acute and chronic inflammation, for in the vast majority of the cases under consideration the ovaries are free and not the seat of tumors. Gynatresias, both congenital and acquired, are also excluded.

RELATIONSHIP BETWEEN OVARIAN DISTURBANCES, MENSTRUAL DISORDERS, AND OTHER ENDOCRINOPATHIC CONDITIONS

An important group into which some of our cases fell is associated with endocrine disturbances. The ovaries are secondarily or simultaneously affected. The hypophyseal disorders are most frequently ac-

accompanied by menstrual disturbances. The worst cases are those of dystrophia adiposogenitalis where the amenorrhea is combined with genital atrophy. In acromegaly the menses can be restored when the tumor is removed. In hypophyseal cachexia (Simmonds' disease) the genital atrophy can be very pronounced. The same is true of multiple endocrine sclerosis in which the hypophysis, thyroid, adrenals, and gonads are severely affected.

The thyroid, thymus, and pancreas influence menstruation to a lesser degree. In Basedow's disease the patient may complain of amenorrhea but it is not the general rule. With the exception of the hypophysis the adrenal gland affects menses to a more marked degree than these glands. Patients with Addison's disease may lose their menses or they may retain them and even conceive.

In an analysis of 167 personal cases* it was found that 55 cases, or 33 per cent, showed some aberration in the secondary sex characters, showing a masculine distribution of the pubic and abdominal hair with or without general hirsutism. In 54 cases a marked gain in weight was noted. Routine basal metabolism determinations were unfortunately not carried out. In 25 cases thus examined, 10 showed a low basal metabolic rate which varied from minus 11 to minus 32, the average reduction being minus 21. There was no definite relationship between the menstrual delay and the basal metabolic rate. In 3 of the patients the basal metabolic rate was sufficiently increased to indicate hyperthyroidism. In 12 patients the basal metabolic rate was within normal limits. One of the patients showing the lowest basal metabolic rate, i.e., minus 32, had other stigmas of polyglandular disturbance.

It will be recalled in this connection that Litzenberg³ found a low metabolic rate in 50 per cent of sterile women, and of those treated with thyroid extract one-third conceived. "One woman of the group became pregnant three times under treatment, bringing the percentage of conception to forty." In a second report Litzenberg speaks of a sterility of 56 per cent in his cases. Forty-four per cent of the 137 women with a low rate had menstrual difficulties: amenorrhea, irregularity, menorrhagia, dysmenorrhea, and scanty flow. Litzenberg³ concludes from his studies that "restoring the metabolic rate to normal by thyroid medication (and hygienic measures) in some cases improves menstruation, permits conception and prevents interruption of pregnancy."

Only one-third of my cases showed symptoms of endocrine disturbance, which were for the most part mild. Of the 76 cases of mild oligomenorrhea (six to eight weeks' delay) the following data were noted in 44: 24 had gained appreciably in weight; 20 showed male hair distribution.

*This analysis was kindly made for me by Dr. Seymour Wimpfheimer, former resident gynecologist of Mt. Sinai Hospital, to whom I am deeply obliged.

In the group of moderate oligomenorrhea (three to six months) consisting of 35 cases, changes were noted in 25. In 13 a gain in weight was the predominant symptom, and in 12 there was some form of hirsutism.

In the group of severe oligomenorrhea (seven months to a year or more), of which there were 5 cases, 3 had gained in weight and 2 showed some type of hirsutism. Of the mild hypooligomenorrhea there were 5 cases, but only 2 showed changes: one a gain in weight and one with hirsuties. In the group of moderate hypooligomenorrhea there were 7 cases; 4 showed change: one, a gain in weight; in the other 3 some form of hirsutism.

Of 16 patients whose periods were regular until marriage, 8 showed some changes; 5 gain in weight; 4 some type of hirsutism. Of the 20 patients with disturbed regularity in menses due to some physical or mental accident, 10 showed changes: 9 a gain in weight and one, signs of virilism. Finally, of 3 patients with complete amenorrhea, all showed a well-marked hirsutism and one had taken on excessive weight. It seems, therefore, that the tendency to gain in weight is greater in those patients with longer periods of amenorrhea. Hirsutism appears to be a striking finding in these cases of delayed and irregular periods.

Marked psychic disturbances, such as sudden fright, great anxiety, fear of a pregnancy, or fear of not becoming pregnant can inhibit the onset of the menses. During the war, J. Novak says, an explosion in a munition factory caused an endemic outbreak of amenorrhea among the factory workers. Psychogenic amenorrhea is not an infrequent condition in time of peace.

* * * * *

THE EFFECT OF MARRIAGE ON MENSTRUATION

In 16 patients the menstrual disturbance began after marriage. In 18 patients with a history of prenuptial menstrual delay, the disturbance became more marked, the periods of delay becoming longer. Eighty-eight patients, or 53 per cent, showed no change in the menstrual cycle. In 10 patients, or 6 per cent, some improvement was noted. There were no patients who became absolutely regular after marriage. On the other hand it is difficult to determine from this study which patient is rendered worse by marriage, as the cases fell into all the above groups with varying periods of amenorrhea. Spontaneous improvement occurred in a few cases.

The associated symptoms of amenorrhea will not be discussed here. As a rule if there are underlying causes they will manifest themselves in disturbances referable to the organs and systems of organs. We are here concerned rather with a more important symptom of hypoovarian disturbances, namely, sterility. Data with regard to the local genitals, the secondary sex characters, and the general constitution were noted.

There were no systematic measurements of the length of the extremities, of the epiphyseal union, of the sella turcica. There were no systematic blood calcium studies or blood pressure determinations, basal metabolism readings, or full blood examinations. The question of deprivation symptoms, of the libido, and other related matters of the genital sphere have also not been dwelt upon. These have been begun more recently and will undoubtedly prove of interest and value in the future.

* * * * *

STATISTICAL ANALYSIS

The symptom complex of ovarian hypofunction and scanty and delayed menses is associated with sterility or lowered fertility.

Since 1915 when Van der Velde began to irradiate the ovaries in cases of oligomenorrhea and amenorrhea, a large number of publications have appeared dealing with this subject.

That pregnancy followed this treatment was noted by Flatau and Thaler. In their first report upon 38 cases they observed 4 pregnancies as a result of treatment. In Thaler's larger series of 147 cases of all sorts of menstrual disturbances treated by weak doses of the x-ray, there were 80 patients with amenorrhea and oligomenorrhea. Five of these became pregnant in the first month following the treatment, a striking result to be sure, provided the factor of chance or coincidence could be ruled out.

That the x-rays exercise a therapeutic influence in these cases of sterility combined with habitually delayed menses is unquestionable. In a larger personal series of 33 patients, over half have become pregnant. This shows an appreciable reduction over the result obtained in my first 12 cases previously reported.¹² Patients were included, however, that may have been unsuited for the treatment in this later series. On the other hand, it became clear that to exclude the factor of chance or accidental therapeutic success it was important to arrive at an answer to the following questions: (1) What proportion of women by and large have *delayed periods* and what proportion of these bear children? (2) What is the percentage of cases of *sterility associated with amenorrhea* in a fairly large number of women who apply for relief of sterility? (3) What is the natural *fertility* in relation to the *menstrual function* of a fairly large number of women who have borne children?

Soon after my first publication I began to include patients with scanty periods and others in whom the periods were habitually delayed for shorter intervals, i.e., five, six, and seven weeks.

In spite of a more general adoption of x-ray treatment in these cases, no large statistical investigation appears to have been made in order to establish the natural incidence of sterility in this group of women or its proportion to normally menstruating women. Knowledge of the aver-

age expectancy for childbearing in any given case with reference to the menstrual function will prove helpful in estimating the aid rendered by any therapeutic agency, medicinal, hygienic, operative or x-ray.

In my first article¹² I attempted to arrive at these points by going over a relatively small number of cases. Twelve patients were subjected to ovarian x-ray irradiation, and pregnancy resulted in 9, or 75 per cent. Two questions naturally arose: (1) May this not have been a particularly favorable group of patients? (2) Would a larger series corroborate these findings? Meanwhile the discovery of a female sex hormone had aroused the hope that perhaps we were on the verge of a hormonal substance comparable in potency to thyroid extract or insulin which would naturally supplant the use of x-rays. For the past two years I have practically abandoned x-ray ovarian irradiation, awaiting the production of an ovarian or ovarian pituitary extract for therapeutic use.

The patients forming the basis of the present study came for the relief of delayed periods per se or because of sterility with which delayed periods happened to be associated.

General incidence of delayed periods (*opsomenorrhea*, *oligomenorrhea*).—It is interesting to compare the actual conceptional childbearing incidence of this group with the chances of conception and childbirth in the general female population. The general incidence of sterility is about 15 per cent according to the best statistics, i.e., at least 85 per cent of the married population have offspring. Of the total number of married women in the present series who had delayed menstrual periods 70 per cent were sterile and 10 per cent more were relatively sterile (this group having conceived once or twice terminating either in miscarriages or in a solitary full-term child). It is at once seen that the average normally menstruating woman has at least 5 times the better chance of becoming a mother than has the woman whose menses are habitually delayed or scanty or both combined.

Since these figures are taken from a private practice, in which perhaps one group of patients may predominate, I have analyzed 1044 consecutive cases from the Gynecological Service of Mt. Sinai Hospital to note their occurrence.*

- 742 had normal menses.
- 201 had menorrhagia.
- 38 had scanty flow (hypomenorrhea).
- 24 had delayed periods with normal flow
(opsomenorrhea, oligomenorrhea).
- 10 had menometrorrhagia.
- 15 had delayed and scanty menses.
- 9 had delayed and profuse menses.
- 5 had periods every twenty-one days.

*I am indebted for these statistics to the Resident House Gynecologist, Dr. B. Urdan.

It will be seen that 87 out of the 1044 patients, or 8 per cent, had either delayed or scanty periods or a combination of both. In 9 patients the periods were both delayed and profuse. In other words, in a general gynecologic service, 8 per cent had some delay or slowing up of the tempo of the menstrual cycle with or without a definite change in the quantity of the menstrual flow.

If we analyze these cases from the viewpoint of their fertility in relation to the menses, we find in the 742 patients with normal menses:

- 62 had no children, or a primary sterility of 8 per cent.
- 59 had 1 to 3 abortions or a secondary sterility of 8.7 per cent.
- The total sterility for this group was 16.7 per cent, and 8.7 per cent were pregnant once to three times, terminating in abortion.
- 113, or 15 per cent, had 1 child and no abortions.
- 37, or 5 per cent had 1 child and 1 to 3 abortions.
- 471, or 63.7 per cent, had 2 to 14 children.

As no data with respect to voluntary or involuntary sterility were obtained, the average relationship may be assumed for this series.

HYPOMENORRHEA GROUP—38 CASES

- 13, or 33 $\frac{1}{3}$ per cent, had no children (3 of these had 1 miscarriage each).
- 1 had 4 miscarriages.
- 7 had 1 child with or without a miscarriage (one of these had 12 miscarriages).
- 17 had 2 children or more.

DELAYED PERIODS BUT PROFUSE—9 CASES

- 2, or 22 per cent, had no children.
- 2 had 1 child only.

HYPOOLIGOMENORRHEA—15 CASES

- 5 out of 14, or 36 per cent were sterile.
- 3 had 1 or 2 miscarriages, a primary and secondary sterility of 55 per cent.
- 2 had 1 child.

OLIGOMENORRHEA—24 CASES

- 5 out of 14, or 36 per cent, were sterile.
- 4 were secondarily sterile.
- 9 were primarily or secondarily sterile, a total sterility of 37.5 per cent.

MENORRHAGIA—201 CASES

- 20 out of 201, or 10 per cent were sterile.
- 75 out of 201 had 1 miscarriage or 1 child with or without miscarriages.

The total number of children are reckoned against the miscarriages and sterility in the different groups and the results are shown in Table I.

TABLE I

TYPE OF MENSES	NO. OF CASES	PRIMARY STERILITY AND SECONDARY STERILITY, WHERE ONE CHILD WAS BORN WITH				WOMEN WHO BORE 2 OR MORE CHILDREN, WITH OR WITHOUT MIS-			
		OR WITHOUT A MISCARRIAGE		CARRIAGES		CARRIAGES		MISCARRIAGES	
		PATIENTS	CHILDREN	MISCARRIAGES		PATIENTS	CHILDREN	MISCARRIAGES	
Normal menses	742	271	150	95		471	1438	223	
Menorrhagia	201	95	58	32		106	478	88	
Hypomenorrhea	38	20	7	6		18	60	26	
Menometrorrhagia	10	5	1	0		5	16	5	
Delayed but profuse	9	4	1	0		5	16	3	
Hypooligomenorrhea	15	8	1	4		6	19	2	
(habitual delay of 5 to 8 weeks)									
Oligomenorrhea	24	7	2	2		17	51	2	
(8 patients had habitual delay of 8 to 24 weeks, and altogether these had 9 children or only 11.3%)						Of the 60 children borne by the 18 patients in the hypomenorrhea group: 2 had 10 children each			
						2	6	“	“
						4	4	“	“
						10	12	“	altogether

The striking difference in this analysis is in the patients who were either totally sterile or who had one child or one or two miscarriages as against the patients who had two children or more. Thus in the normally menstruating group there were 271 patients with 150 children and 95 miscarriages, i.e., a fertility of 55 per cent with 30 per cent miscarriages; whereas in the patients with the delayed or scanty menses or a combination of both of these, 38 in number, there were altogether 11 children and 25 miscarriages, or a fertility of 29 per cent, while the miscarriages were appreciably increased, i.e., to 66 per cent.

The menometrorrhagia group showed 5 patients with but 1 child and no miscarriages, again showing a marked reduction in the fertility.

Comparison between the normally menstruating group in patients who had no children or less than two children shows:

Normal menses: 271 patients, 150 children, 55 per cent fertility.

Disturbed menses: 43 patients, 12 children, 27 per cent fertility.

Of the whole group of 1044 patients, 104 were primary sterilities or about 10 per cent, and 301 were secondarily sterile, or 29 per cent.

We also see that about 30 per cent of the 1044 patients (or 310 patients) showed some abnormality in menses, at least 22 per cent being of the menometrorrhagia group.

The relative degrees of amenorrhea were found to bear a definite relationship to the sterility. For example, of the 15 patients with hypogonadism, 12 (six to eight weeks' delay) bore a total of 12 children and had 5 abortions; whereas 3 (eight to twelve weeks' delay) had no children and only 1 abortion.

Of the 24 patients with oligomenorrhea there were 13 patients with the menses delayed for from five to six weeks. These bore a total of 32 children and had 8 abortions. There were 3 patients with a delay of seven to eight weeks, with 5 children altogether and no abortions. There were 8 patients with a delay of eight to twenty-four weeks with 9 children and no abortions. If we deduct from the last group the one patient who bore 6 children, there remain 7 patients of whom 3 had children.

Schroeder found that one-fourth of all gynecologic cases treated by him at Kiel showed some irregularity in the periods. The cases with delay from five weeks and over formed 6 per cent of his polyclinic patients taken for a period of two years (1924 and 1925), i.e., 482 out of 8085 patients, and 5 per cent of his private patients for the same two years, i.e., 47 out of 966 patients.

Comparisons with other groups were not available. Unfortunately the conceptional and birth incidence of Schroeder's cases are not given. It is hoped that such statistics will be forthcoming from other clinics, since they will help us to formulate better therapeutic and prognostic conclusions. The statistical study here presented by no means covers a number of points which might prove of interest and value.

THE NATURAL INCIDENCE OF PREGNANCY IN THE UNTREATED CASES OF
DELAYED AND SCANTY PERIODS

In the 77 cases of the Mt. Sinai Hospital gynecologic material comprising oligomenorrhea (24 cases), hypomenorrhea (38 cases), and hypooligomenorrhea (15 cases), there was a total of 23 sterile women, or about 30 per cent. If we include the three women who became pregnant once or twice but did not bear a full-term living child, we shall have a total of 37 per cent of sterile women. The longer the habitual delay the less they were likely to conceive. The majority of these patients fell into the group having their menses every six to eight weeks.

In my first publication I found 3 out of 54 who became pregnant without having received any treatment for the abnormal menses or for the sterility. It must be emphasized, however, that in those cases the intervals of delayed menses were longer than three months as a rule. Cases of shorter intervals of delay were included later on, as it was thought x-ray treatment might benefit these as well. Such benefit does not appear to have followed.

One hundred and sixty-seven patients with habitually delayed menses were carefully analyzed with respect to the length of delay. In 75 of these the periods were delayed as a rule from six to fifteen weeks. In 35 patients from sixteen weeks to nine months, and in 5 the delay was greater than nine months. There were 12 patients with delayed and scanty periods of which 5 noted their delay as between six and fifteen weeks and 7 between sixteen weeks and nine months. The others had periods of delay up to six weeks.

That hypofunction is a cause of sterility is borne out by the high percentage of childless women in this series. Of the 167 patients 147 were married women of whom 102 were sterile, almost 70 per cent; 18 more were relatively sterile. In other words 82 per cent of these patients had lowered fertility, or sterility. The relatively sterile women had conceived but did not carry to full term, or having borne one child, failed subsequently to become gravid. Therefore, a few cases of one child sterility are included in this study.

Of the 167 patients with habitually delayed menses, 148 were married. Thirty became pregnant. Of these 9 had one miscarriage, 10 had only 1 child each, 7 had 2 children, 3 had 3 children, and 1 had 4 children. If we include the 19 patients who were pregnant only once, the latter terminating in a full-term child or in a miscarriage, there are left 11 patients out of 148 who had 2 or more children. In other words there was a primary sterility among these 148 patients with more prolonged delay of menses in 80 per cent, and a secondary sterility in 13 per cent, making a total of 93 per cent sterility.

The history with regard to the duration of the marriage in the sterile group and the interval of menstrual delay is drawn from 215 cases, shown in Tables II and III.

TABLE II. PRIMARY STERILITY WITH AMENORRHEA (154 CASES)

AMENORRHEA	NO. OF CASES	MARRIAGE	NO. OF CASES
A. Patients with one period of amenorrhea (18 cases)			
3 to 6 months	4	1 to 3 years	8
1 to 2 years	5	4 to 15 years	10
4 to 15 "	9	and longer	
None of this series became pregnant without treatment.			
B. Habitual Amenorrhea (136 cases)			
Under 1 month	14	Under 1 year	13
1 to 3 months	58	1 to 2 years	22
3 to 6 "	40	2 to 3 "	22
6 to 12 "	24	3 to 5 "	38
Of these patients only 2 became spontaneously pregnant		5 to 20 "	51

TABLE III. RELATIVE STERILITY WITH AMENORRHEA (61 CASES)

	DURATION OF AMENORRHEA	NO. OF CASES
A. Patients with only one period of amenorrhea	4 months	1
	9 "	4
	1 year	1
	1½ years	3
	2½ "	1
	3 "	1
B. Patients with habitual amenorrhea	Under 1 month	8
	1 to 3 months	21
	3 to 6 "	12
	6 to 10 "	9
Two out of this series became spontaneously pregnant.		

THE INCIDENCE OF DELAYED MENSES IN RELATION TO PREGNANCY IN A SERIES OF 600 CONSECUTIVE OBSTETRIC CASES

There were 425 patients with normal menses.

There were 175 patients with irregular menses. Of the latter, 140 patients gave a history of habitual delay. The delayed menses of these 140 patients were grouped as follows:

Under 1 month	82 cases
1 to 2 months	30 "
2 to 4 "	20 "
5 to 12 "	8 "

As these 140 cases include 33 patients treated with x-rays, it leaves 107 patients that became spontaneously pregnant out of the 600, or a fertility of 18 per cent. If, however, we deduct the 82 patients whose menstrual delay was under a month, we have left 25 patients whose menstrual delay was habitually longer than a month and though not treated for the condition became pregnant, giving them a 4 per cent fertility. It is obvious that the greater the delay in the menstrual periods the smaller will be the percentage of gravid cases.

DYSMENORRHEA ASSOCIATED WITH DELAYED MENSTRUATION

It is interesting to note that of 167 patients, 21 or 12.5 per cent complained of dysmenorrhea. The menstrual pain, however, was mild in the majority.

In 53 patients or 32 per cent the onset of menstruation was given at the age of fourteen or later.

EXCLUSION OF OTHER CONTRIBUTING FACTORS

The possibility of the tubes as a causal factor was checked in 106 of the 167 cases. Nonpatency of the tubes was found in 13 per cent of these cases. This is in marked contrast to the general occurrence of closed tubes in otherwise normally menstruating women treated for sterility in whom we have found at least 33, 39 per cent of closed tubes. The peculiar relative immunity that these women enjoy invites speculation. One explanation may here be offered at least, and that is that infections are more liable to occur during menses and the opportunity is less in women who menstruate infrequently.

Another important factor as a cause of sterility, namely the male, could also be excluded because in most of these cases the male was found to be potent as judged by the quality and quantity of his semen (condom and Hühner tests).

TREATMENT

From the foregoing relationship between hypoovarian activity and sterility, it readily follows that any form of treatment must necessarily have for its purpose the stimulation of ovarian function, thereby improving the chances for fertility.

RESULTS OF REPLACEMENT THERAPY

The preparations of gland extract in common use, such as ovarian residue, varium, agomensin, corpus luteum, thyroid extract, and anterior pituitary were also employed in these cases. Sometimes calcium lactate and calcium chloride were added on the basis of some connection between ovarian hypofunction and disturbed calcium metabolism. In other cases, an attempt was made to improve the general health of the individual by the usual measures of diet, hygiene, and tonics. In 57 cases such therapy was used with practically no effect. There was an improvement of function followed by pregnancy in only 2 cases observed over a period of years, but whether this was due to the treatment it is difficult to say.

Pregnancy occurred in 10 patients who received gland extracts in one form or another. Four of these patients became pregnant during the amenorrheic phase so that it was not possible to compute the expected date of labor. By carefully noting the duration of gestation in all these cases in the future some idea may be obtained as to the relation between the ovulation preceding the conception and the last preceding menstruation.

Since it is possible to assay ovarian extracts containing the active principle according to more recent pharmacologic methods, a number of preparations here and abroad have offered better prospects of success. Of the foreign products, progynon, menformon or follicular panhormon, hormova, and glandofoli are produced on a pharmacologic

basis (on the mouse unit system). Oestrogen and amniotin are American products which are elaborated on the same principle. The effect upon human females has so far not satisfied expectations. Apparently effects upon mice cannot be reproduced in human beings. Conditions in the mouse are obviously very different from those in the human. As Novak well says, we are dealing with a healthy animal whose uterus, if immature, is nevertheless susceptible to maturity. So far I have not seen improvement or restoration of menstrual function in my own cases, but it is possible that I put these organic extracts to too hard a test in advanced cases of amenorrhea. Prolan (Zondek) represents an extract of anterior lobe pituitary. This is supposed to support the action of progynon. The hypophysis has been proved experimentally to be a powerful stimulant to the ovaries. Emmenagogues, such as potassium permanganate, apiol, yohimbin, salipyrin, aloes, and cathartics, are still recommended in combination with the older and new organic extracts. Their action is most probably through the increase in pelvic hyperemia.

The relatively poor results obtained with opotherapy prompted us to resort in 1923 to x-ray irradiation of the ovaries. A striking improvement followed this treatment in 33 patients of whom 16 became pregnant shortly afterward.

Mild *hypophyseal irradiation*, especially in delayed, very weak or irregular periods, has proved of value. The menses become regular more or less permanently and more profuse. Dysmenorrhea is incidentally also cured. Novak ventures the opinion that this is due to the sense of satisfaction the patient derives from knowing that her menses have returned to normal.

The way in which hypophyseal irradiation stimulates normal menstruation is not clear; nor the manner in which *mild ovarian irradiation* accomplishes its end. Whether it is stimulating or destructive (as claimed by Holzknecht) is still a question. There is still uncertainty concerning the hormonal function of some of the elements of the ovary. That the follicle apparatus and corpus luteum produce an inner secretory substance is generally recognized. The action of the interstitial gland is still disputable. Finally, as L. Adler¹³ intimates, whether there exist one or several ovarian hormones is a matter awaiting solution.

We can agree with Novak that there is real danger of destroying through the x-rays the last remnant of the functional portion of ovarian tissue. Further, the theoretical damaging of the germ-plasm and eventually of the offspring which has, so far, not been demonstrated, is nevertheless not to be dismissed altogether. The babies born after treatment with mild x-rays, in my own experience have all proved, so far, to be normal in every way. There can be no question, however, that it is better to try the preliminary x-ray treatment of the hypoph-

ysis before resorting to the ovarian irradiation, even though the former is also fraught with theoretical danger.

SUMMARY AND CONCLUSIONS

In ovarian hypofunction, the opportunity for fertilization is diminished in proportion to the reduced ovulation. Other contributing factors as tubal occlusion, male impotence, etc., must, however, be excluded as entering into the causation of the sterility. We have shown in this study that the natural incidence of fertility is smaller in women with habitually delayed periods than in women who menstruate normally.

The material upon which the present analysis was based consisted of 1044 consecutive gynecologic cases from Mt. Sinai Hospital and 4642 private gynecologic cases, 2200 private cases of sterility, and 600 private obstetric cases. The object of the study was to determine the occurrence and incidence of habitually delayed menstruation, the sterility, and fertility attending it as compared with normally menstruating women of these three groups and the general population. It was found that the menses are habitually delayed or scanty in 3.5 to 8 per cent of gynecologic patients and in about 10 per cent of patients whose marriage is sterile. These patients are more apt to be sterile than normally menstruating women, the primary sterility varying between 30 and 70 per cent; and the total sterility, including secondary sterility, amounting in some groups to as high as 93 per cent.

The longer the periods of delay the greater is the sterility percentage. Patients having periods of delay under a month have 5 to 8 times the better chance of conceiving than those whose periods are habitually delayed from four to six months. On the other hand, women who menstruate normally have, by these statistics, at least 12 times better chance than those whose menses are habitually delayed for a month, and many times more the conceptional advantage over those whose menses are habitually postponed for longer periods.

Not only are primary and secondary sterility greater in those patients with hypo- and opsomenorrhea but their total fertility is considerably diminished in proportion to the reduced number of periods per year.

As both the delayed character of the periods, their paucity, and the associated sterility and reduced fertility are expressions of ovarian hypofunction, it follows that any treatment to be effective must be concentrated upon increasing or improving ovarian function. Restoring good nutrition, improving the general hygienic and psychic conditions of the patient, in other words, general constitutional improvement, is the first prerequisite. Thyroid treatment in the deficient basal metabolic rates, the administration of ovarian extracts of proved potency, of pituitary extracts, and emmenagogues are auxiliary agents. These,

however, are efficacious in few cases so far on account of the relatively inactive products that are available. An ovarian extract containing a specific hormone in sufficient quantity to make up the deficiency in any given case has so far not been elaborated, but the future holds out a fair promise for success.

A more definitely proved and more efficacious physical agent is available in the use of x-rays. Small doses of the latter applied first to the hypophysis and if necessary to the ovaries have proved successful, not only in restoring the menstrual periodicity to more nearly the normal in 80 to 90 per cent of the patients, but it has also incidentally increased their fertility to at least 50 per cent. The theoretical damage of germ-plasm which is supposed to result from this treatment has, so far, not been demonstrated. Nevertheless, it appears highly desirable to supplant this treatment by a specific endocrine product whose potency should compare to insulin for example. From the more recent indications it may prove to be a combination of ovarian with pituitary extract. The hormone or hormones need not necessarily be isolated from the ovaries or hypophysis themselves but more conveniently and in adequate quantities from excretions and secretions in which they have already been abundantly found, as well as in the placenta.

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911 PARK AVENUE.

A REVIEW OF BREECH DELIVERIES DURING A FIVE-YEAR PERIOD AT THE SLOANE HOSPITAL FOR WOMEN*

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THE infant mortality in breech births has not been decreased. This is shown by a study of our own cases and a review of the recent literature.

The belief that the constant critical study of large series of cases, the methods used, the mistakes made, and the end-results obtained, will aid in decreasing this mortality, is our reason for presenting this paper.

Since 1920 the majority of stillbirths and neonatal deaths at Sloane Hospital have had careful autopsies under the direction of Professor W. C. Johnson. His findings agree with the constantly increasing

TABLE I. FIGURES SHOWING MORTALITY IN BREECH BIRTHS AS REPORTED IN RECENT YEARS

Pierson, Sloane	1923	12 %
Lang, Frankfurt	1911-1926	13.1 %
Heidler, Vienna	1920-1926	11.45%
Holland, London	1922	9.6 % (definitely due to breech delivery)
Poulain, Paris	1922-1926	11.05%
Ridler, Australia	1926	13 % (gross)
Irving and Goethals, Boston	1926	9.78%
Rasmussen, Oslo	1926	14.2 % (gross)
		21 % (gross)
Gibberd, London	1927	13.7 % (corrected)
King and Gladden, New Orleans	1928	10.12%

number of autopsy reports and confirm the opinions of Van Reuss, Holland, Ehrenfest and others, that in breech birth 75 per cent of the deaths of viable babies are due to birth injuries.

In 1923 R. N. Pierson reported our results for the years 1920, 1921, and 1922, giving a 12 per cent infant mortality among viable babies and the autopsy results in these cases.

The 348 cases reported in the present paper include all breech deliveries during the years 1923 to 1927 inclusive. Ninety-two of these babies were markedly premature or macerated, weighing under four pounds, and are briefly reviewed in Table II.

*Read at the Fifty-fourth Annual Meeting of the American Gynecological Society, Old Point Comfort, Va., May 20-22, 1929.

TABLE II. REVIEW OF CASES DISCARDED FROM SERIES BECAUSE FETUS WAS MACERATED OR WEIGHED UNDER FOUR POUNDS

Toxemia of pregnancy	24
Cardiac	2
Pneumonia	1
Syphilis	9
Diabetes	3
Serious pyelitis	3
Placenta previa	1
Unclassified or undetermined	43
Living babies discharged from hospital in this group	6
Total	92

The largest babies in the entire group that were not macerated weighed 3 pounds 7 ounces, 3 pounds 5 ounces, 3 pounds 5 ounces, 3 pounds 13 ounces, 3 pounds 10 ounces and 3 pounds 14 ounces. In these cases there were no maternal complications and all the children lived.

In 256 cases, the babies were not macerated and weighed over four pounds. One hundred and thirty-three of these patients were primiparae, among which there were 11 stillbirths, a gross infant mortality of 8.3 per cent. There were 123 multiparae, with 25 stillbirths, a gross infant mortality of 20 per cent. A brief summary of the history, clinical and autopsy findings of each of these 36 deaths is appended, allowing each reader to compute his own net mortality from the gross figures. It will be noted that among these patients 4 had gross fetal abnormalities, 6 were markedly premature according to the menstrual history, 4 others were in cases complicated by placenta previa, and in 2 there were fibroids. In one there was presumptive evidence that the mother destroyed the baby. The majority of these cases were among the multiparae, which partly accounts for the high mortality in this group.

TABLE III. SUMMARY BY YEARS OF CASES OF STILLBIRTHS AT SLOANE HOSPITAL

UNCORRECTED MORTALITY 1923-1927				MORTALITY CORRECTED BY ELIMINATION OF BREECH DELIVERIES WITH FETAL ANOMALIES AND PLACENTA PREVIA		
	Primipara Per Cent	Multipara Per Cent	Total Per Cent	Primipara Per Cent	Multipara Per Cent	Total Per Cent
1923	11.5	16	14	11.5	13	12.5
1924	8	35	21	8	35	21
1925	8	22	15	8	16	12
1926	0	17	11	0	8+	5
1927	8	15	11	8	10+	8.9
5 year mortality	8.3	20	14	8.3	15.5	11.11
Maternal mortality 0.75 per cent, one case serious condition when admitted after 4 days of hard labor, shock and hemorrhage.				Maternal mortality 0.86 per cent, streptococcus, hemolytic, septicemia.		
TOTAL CASES				STILLBIRTHS		MORTALITY Per Cent
Placenta previa	4			3		75
Prolapsed cord	12			8		66 $\frac{2}{3}$

Gross mortality 14 per cent
Eliminating fetal abnormalities inconsistent with life and placenta previas 11.1 per cent

It is difficult to evaluate briefly the net mortality figures from published reports, as each author has his own standard for reaching this figure. Many authors in giving net mortality statistics eliminate all such cases as those reported above, and some still further reduce their mortality by eliminating those cases complicated by toxemia of pregnancy, contracted pelvis, or prolapsed cord. In many of the older statistics as well as in some of the recent figures neonatal deaths are eliminated. The gross mortality in these 256 cases, including all stillbirths and neonatal deaths, is 14 per cent. Even eliminating the 4



Fig. 1.—Under deep anesthesia especially with a moderate Trendelenburg position it is possible to push the presenting part out of the birth canal.

cases of gross fetal abnormalities inconsistent with life, and possibly the serious placenta previas, we would still have a net mortality of 11.1 per cent.

Sloane Hospital is a teaching institution. A large number of undergraduates are constantly being instructed as well as a large intern staff which serves for a period of one year, and a resident staff which serves for three years longer. It has been our aim to teach the undergraduate students the principles of obstetrics and the prevention and recognition of the various complications. They examine as many women as possible and deliver some normal cases. They see the opera-

tive deliveries and have impressed upon them the dangers to the mother and child of operative interference and the necessity of much further training before they are capable of doing such procedures. It has been our policy, on the other hand, to allow the carefully selected intern staff and a resident staff selected from the interns to do as many of the operative procedures as possible, under supervision. Twelve or 15 attendants also have the privilege of delivering cases in the hospital. An average of 18 different operators have taken care of the breech deliveries each year. The least experienced of these operators have handled the multiparae under the false impression that they were



Fig. 2.—The birth canal is available for various manipulations. The feet can be found easily and reduced and the cord loosened, preventing shock to the child or separation of the placenta. The arms can be folded on the chest or a fillet applied.

the easiest cases. Tables III, IV, V, and VI summarize briefly the cases in which stillbirths occurred.

A very large proportion of the infant mortality in breech births occurs among macerated, abnormal and premature children and also in cases of multiple birth. This mortality will be reduced by better prenatal care.

External version is being more and more advocated. We agree with Bartholomew who recently discussed the subject before this Society, as well as with Ryder, Gibberd and many others who have advocated routine version in properly selected cases at the eighth month of pregnancy, and feel that with greater experience more of these cases can

TABLE IV. SUMMARY OF STILLBIRTHS AND COMPLICATIONS FOUND AMONG THE PRIMIPARAE

63 per cent stillbirths autopsied	{ 4 Intracranial injury 2 Other injuries 1 Congenital pneumonia
37 per cent stillbirths not autopsied	{ 3 Probable intracranial injuries 1 Probable congenital pneumonia 1 Probable fracture of neck
55 per cent of mothers had abnormal pelvis	
82 per cent had some difficulty with cervix	
27 per cent prolapsed cord	
36 per cent premature rupture of membrane	
18 per cent prolonged labor	
The largest baby in this group weighed 8 pounds 13 ounces. In one case the mother had toxemia of pregnancy, induced labor and the child died from prematurity.	
Gross mortality in primiparae	8.3 per cent
Corrected mortality	7.5 per cent

TABLE V. SUMMARY OF STILLBIRTHS AND COMPLICATIONS FOUND AMONG THE MULTIPARAE

66 per cent of stillbirths autopsied (17)	{ 12 Intracranial injury 3 Congenital pneumonia 3 Other injuries 4 Spinal injuries 1 No cause of death found 2 Congenital anomalies
32 per cent of stillbirths not autopsied	{ 3 Probable intracranial injuries 2 Probable congenital pneumonia 2 Probable congenital anomalies
32 per cent of mothers had abnormal pelvis	
40 per cent had some difficulty with cervix	
20 per cent had prolapse of cord	
42 per cent had early rupture of membranes	
12 per cent had placenta previa	
20 per cent had prolonged labor	
16 per cent fetal anomalies	
16 per cent abnormally large babies weighing 10 pounds 5 ounces, 10 pounds 9 ounces and 11 pounds 11 ounces.	

TABLE VI. ABNORMAL PELVIS AND PREMATURE RUPTURE OF MEMBRANES

	PRIMIPARA PER CENT	MULTIPARA PER CENT
1 Incidence of abnormal pelvis	18	22
2 Incidence of abnormal pelvis in cases with stillbirths	60	32
3 Incidence of abnormal pelvis in cases with ruptured membranes	23	32
4 Incidence of abnormal pelvis in cases with intact membranes	16	18

be turned and the infant mortality, which even now is under 2 per cent due to this operation, can be reduced. There are, however, a large number of cases which cannot or should not be turned.

The undilated cervix remains as the chief source of danger in breech deliveries. It will be noted that among our stillbirths, 82 per cent of the primiparae and 40 per cent of the multiparae had trouble on

account of the cervix. The dilatable but not paralyzed cervix was the chief error in judgment. A "hands off" policy until the cervix is completely dilated of course should be the rule, but there are many cases where the cervix will not dilate even after prolonged labor. This is



Fig. 3.—The buttocks brought to the hollow of the sacrum using all available space without angulation of the child's body.

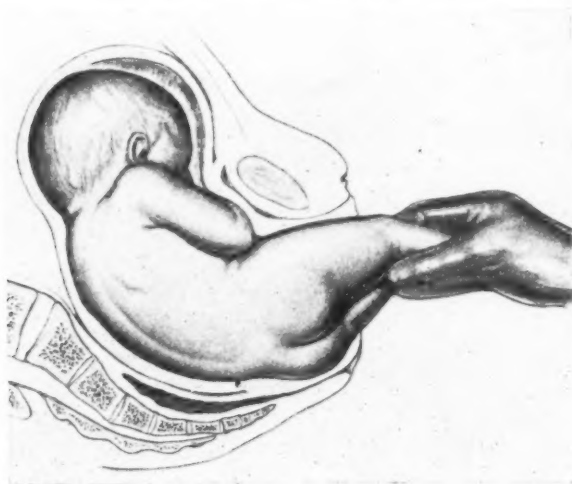


Fig. 4.—Gentle traction on anterior foot rotates buttocks into the direct antero-posterior diameter of the pelvis. After the birth of the buttocks, continued traction downward and forward brings the back parallel to the symphysis.

especially true in cases of contracted pelvis. Sixty per cent of our primiparae and 32 per cent of the multiparae in whom the cervix was a complication had contracted pelvis.

We dread the neglected case where the membranes have been ruptured for hours and where the cervix is undilated and the child compromised; bringing down one or both feet has not given satisfactory results. In 22 cases where the bags were used there were 5 stillbirths. Even the largest bags did not give complete dilatation and the paralysis of the cervix necessary for a safe delivery. On the other hand, Zangemeister and Baer induce labor as a matter of routine with the

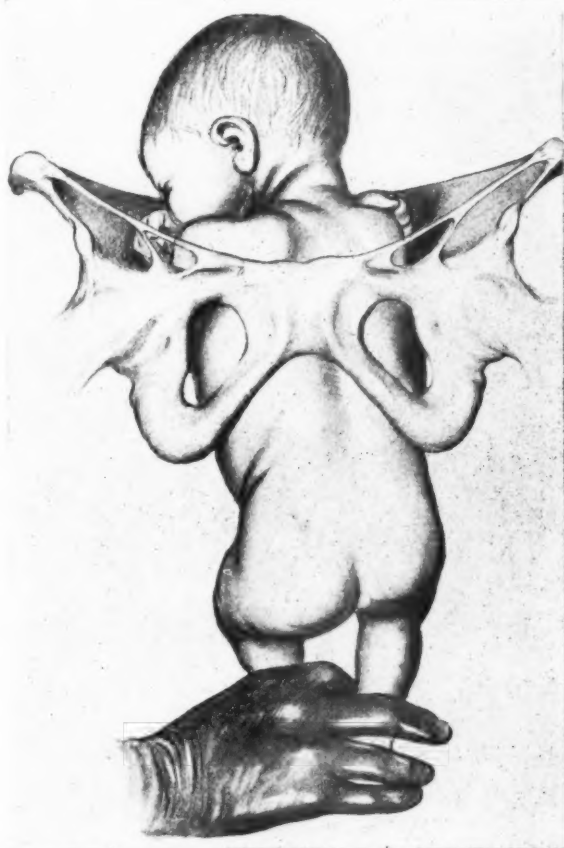


Fig. 5.—Continued very gentle downward traction engages the shoulders in the transverse diameter of the inlet. Extended arms in this diameter seldom cause much trouble.

aid of Zweifel's bag in all cases with contracted pelvis and in many others. They report 88 per cent normal deliveries and a remarkably low infant death rate. We have always dreaded induction of labor in such cases.

Manual dilatation of the cervix is most unsatisfactory. Serious tears and imperfect paralysis are too frequent. Cutting of the anterior lip of the cervix should frequently be done in such cases, even in pla-

centa previa, as Essen-Möller has shown us. Occasionally one of the low cesarean sections is indicated. Due consideration must be given, however, to the large number of neonatal deaths due to congenital pneumonia in this type of case.

The Pomeroy bag, which is now rightfully discarded as a means of eliminating the first stage, has nevertheless frequently been found useful by us. When the cervix is soft and dilatable, it is a very satis-



FIG. 6.—When the shoulders have passed the inlet, by inserting the hand parallel to the symphysis one shoulder is pushed backward into the hollow of the sacrum. This prevents torsion of the body.

factory means of paralyzing the cervix and dilating the entire birth canal. We regret that the demand for this bag was so small that the manufacturers no longer make it.

The improper or careless handling of the first stage and the excessive use of the various sedatives to prevent pain increase the difficulty with the cervix.

Prolapse of the cord was found in 12 of the 256 cases, and 8 stillbirths resulted. Doctor Caverly of our service found in a previous series of cases 35 prolapsed cords among 6947 consecutive deliveries, 8 or 22.8 per cent having occurred in breech presentations. The mor-

tality in vertex presentations was only 26 per cent, while the mortality in the breech cases was 75 per cent, partly due to careless watching of the patient but mostly due to frantic efforts to deliver the baby at once. It should be easier to replace a prolapsed cord in a breech presentation than in a vertex and the proper use of bags and the necessary paralysis of the cervix before the extraction of the child should save more of these babies.

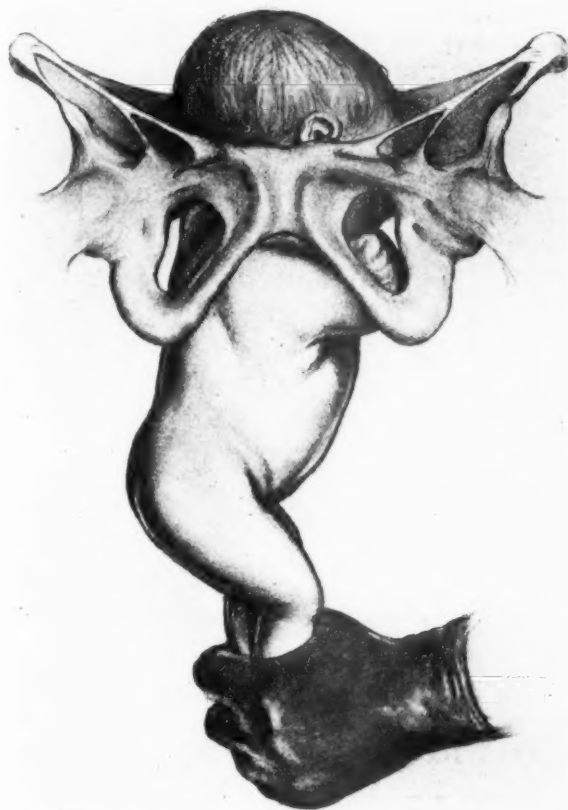


Fig. 7.—Traction downward and backward allows the shoulder to engage under the symphysis.

Many writers including Rasmussen, Irving and Goethals, as well as Piper and Bachman in their recent article, have advised the routine interference with the second stage under deep anesthesia. This allows the patient to be completely relaxed and placed in the most favorable position for the delivery. The soft parts can be properly prepared for the birth, permitting the operator to adjust the child to the birth canal and use all the available space without angulation of the child's body. He can loosen the cord, preventing shock to the baby or the separation of the placenta. It allows the operator to reduce the arms which are

frequently extended above the head as shown by Bonney, Potter and others, and which we can confirm by our own experience. It allows the operator to prevent impactions or to correct them with the minimum force when they do occur. Plenty of time should be taken in the various maneuvers, even though the child inhales amniotic fluid, as any undue force will surely kill it. Unquestionably, in the hands of individual operators the routine interference with the second stage gives



Fig. 8.—When one arm has been delivered and the other arm is high in the pelvis, the anterior shoulder can be pushed back into the birth canal, the head loosened at the brim, and the body rotated completely around so as to bring the other shoulder underneath the symphysis.

reasonably satisfactory results, saves time and suffering and prevents some complications. We followed this policy as a matter of routine for a short time but our mortality increased so greatly due to the misjudgment of the cervix and to various other complications which arose in the hands of the less experienced operators that we returned to the more conservative "hands off" policy with a marked reduction in the mortality. Even in normal labors where the child is born to the umbilicus, the delivery of the shoulders and after-coming head



Fig. 9.—When the arms are born, the body should be kept parallel to the woman's thigh and the shoulders should be pushed backward and upward into the birth canal. This permits the head to be loosened at the brim and flexed by external manipulation.



Fig. 10.—With the head well flexed and the occipital frontal diameter of the head in the transverse diameter of the inlet, external pressure pushes the head into the hollow of the sacrum. Excessive pressure ruptures the falx. Note the position of the mouth when the biparietal is in the hollow of the sacrum.



Fig. 11.—Rotating the child's body and head after the biparietal has reached the hollow of the sacrum.



Fig. 12.—Protecting the child's neck by the large finger of the operator's hand until the occipital protuberance is underneath the symphysis. Piper's forceps can be advantageously used at this stage.

should be done under deep anesthesia, and precipitate deliveries must be guarded against, as shown in the summary of our cases.

We have seldom used forceps on the after-coming head. Undue pressure from above undoubtedly increases the biparietal diameter, frequently ruptures the falx and when the tentorium has been torn, forces the medulla oblongata into the foramen magnum. When such



Fig. 13.—With the leverage on the big finger the entire body can be swung up without angulation of the neck.

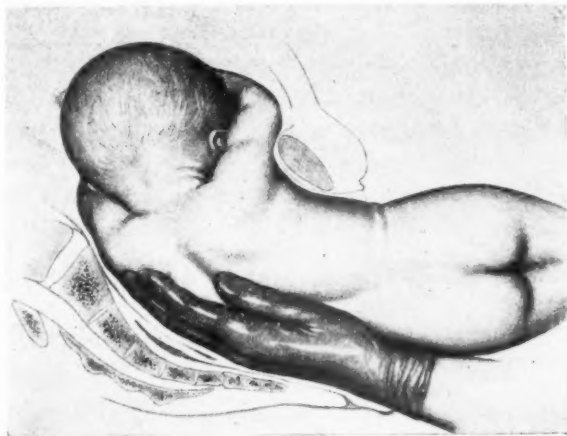


Fig. 14.—Reaching for the posterior shoulder high up in the pelvis results in dangerous angulations and traction on the child's body, causing Erb's palsy and hemorrhages into the cord.

force is necessary, the use of forceps will not save the baby. With large fat women, when the patient cannot be completely relaxed or when proper assistance is not available, the occasional use of the Barton forceps may help to bring the head down into the pelvis. These forceps slip on easily and have been used in 3 such cases by one of us. When the head is in the pelvis the Piper forceps is proving a very useful instrument.

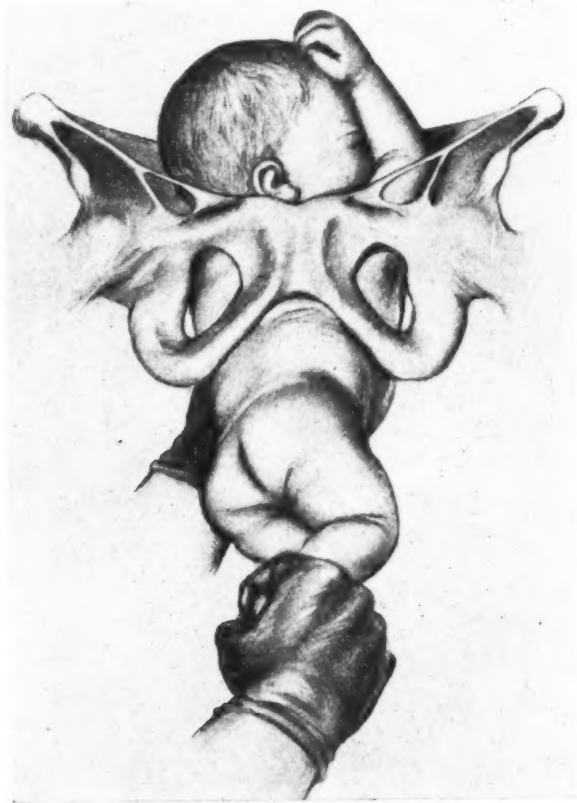


Fig. 15.—In impacted shoulders traction or rotation causes serious injury. It is safer to take plenty of time so as to push the shoulders above the brim where frequently the arms can be reduced or placed into the transverse diameter where they seldom cause trouble.



Fig. 16.—Dangerous twisting and angulation of the child's neck.

Table VII giving the ratio between spontaneous and operative deliveries is very interesting and is a great argument for the "hands off"

TABLE VII. QUOTING INCIDENCE OF SPONTANEOUS AND OPERATIVE DELIVERIES WITH THE INFANT MORTALITY IN EACH GROUP

CLINIC	BREECH CASES	SPONTANEOUS		OPERATIVE		TOTAL MORTALITY	CORRECTED MORTALITY
		PER CENT	PER CENT MORTALITY	PER CENT	PER CENT MORTALITY		
Rimey-Baudeloque 1890-1911	1302	76.3	9.52	18.7	25.8	18.8	
Cuny-Herff, Basel 1902-12	1389	89.9	3.6	5.1	16.9	10.2	
Guys Hospital, Gibberd 1927	221	61	Not stated	39	Not stated	22	13.7
Heidler, Vienna 1920-26	65	43	9.9	57	13	11.45	
Breslau Klinik Busse 1911-16	361	16.07	Not stated	84	Not stated	17.45	
Frankfurter Klinik Lang 1911-26	729	11	Not stated	89	Not stated	13.1	8.8
Ridler 1926							

Fetal death rate in cases, including prematures, delivered by nurses, 5.4 per cent
Fetal death rate in cases, including prematures, delivered by residents, 19.1 per cent

policy in breech births. Still even in the most conservative clinics a very large proportion of the cases end in operative interference and the mortality in such cases is very high.

In view of such a large infant mortality, of the prolonged labor



Fig. 17.—Dangerous angulation of the child's neck by too early rotation of the head.

which is frequently necessary to deliver such cases safely, and of the serious complications often involved, it is not surprising that many individual operators, especially among the general surgeons, are resorting more and more to cesarean section as a quick and easy way out of the difficulty in breech presentations. Some of our stillbirths could have been saved by cesarean section but its frequent use will undoubtedly increase the maternal mortality and is unnecessary in the vast

majority of cases. Cesarean section is indicated in the elderly primipara if any difficulty with the delivery is foreseen. Repeated breech presentations in the same woman are comparatively rare. This should be taken into account with young women whose future pregnancies might be jeopardized. In cases of contracted pelvis, cesarean section should be seriously considered not only on account of the unmoulded after-coming head but also on account of the difficulty in dilating the cervix.

Crothers as well as Ehrenfest has recently stressed the birth injuries among babies that survive breech delivery. The reports from our follow-up clinic show a surprisingly small number of such cases. Comparing this series with those reported by Pierson in 1923, we find that we now have fewer broken necks, and that the injuries are not as extensive as in his series.

The accompanying figures show the technic advocated by us in order to avoid angulation and torsion of the child's body, cord complications, and breech impactions.

CONCLUSIONS

In order to decrease the infant mortality we would emphasize the necessity of:

1. Better prenatal care including external version in proper cases.
2. The thorough study of each individual case, multipara as well as primipara, in order to anticipate complications as much as possible.
3. Greater use of the cesarean section in elderly primiparae and in contracted pelvis where not only the unmoulded after-coming head but difficulty with the cervix must be considered.
4. A "hands off" policy as long as the labor is advancing.
5. Constant watchful care throughout the labor to prevent complications or to interfere when they occur, using sedatives with great caution.
6. In breech extractions, sufficient time should be taken under deep anesthesia to prepare the birth canal, to prevent torsion and angulation of the child and to prevent and correct impactions gently. The cord can be compressed or even cut without great danger to the child.

(For discussion, see page 720.)

THE ACTIVE IMMUNIZATION OF PREGNANT AND PUERPERAL
WOMEN WITH STREPTOCOCCAL TOXINS AGAINST
STREPTOCOCCAL PUERPERAL FEVER

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NOTWITHSTANDING the many advances in the prevention and management of obstetric complications and sequelae, the incidence of streptococcal puerperal fever with its mortality and morbidity still remains high. It is for this reason that further investigations are necessary to devise prophylactic and therapeutic measures to combat this disease. The appalling mortality of puerperal fever of former centuries, especially that during the time of the beginning of maternity hospitals, is too well known to require elaboration. These unfavorable conditions continued to be universal until 1847, when Semmelweis introduced antiseptic measures and decreased the mortality in his own clinic from 11.4 per cent to 1.27 per cent. However, it was not until 1870, when Lister firmly established the principle of antiseptics, that Semmelweis' conception was generally accepted. Notwithstanding the general dissemination of the knowledge of antiseptics and later asepsis, there has been since the beginning of the twentieth century, no appreciable decrease in the puerperal morbidity and mortality. In the volume of unprejudiced mortality statistics published in July, 1926, W. C. Davis, Chief Statistician of the Census Bureau, reports that the United States has a total puerperal mortality rate of 68 to 10,000 births, one-half of which is due to sepsis and eclampsia. According to the census bureau we have an estimated population of 111,000,000 with an annual birth rate of 2,500,000 which means that 8,500 women die each year from puerperal fever or eclampsia, both preventable diseases. However, it should be understood that the rates in the United States include the colored race, which still shows a total mortality of 111, a puerperal sepsis of 38 and deaths from other puerperal causes of 73, or nearly double that of the white mothers included in the calculations. That we still have much to achieve is realized from the fact that a bulletin of the Children's Bureau at Washington places us in regard to maternal welfare fourteenth in a list of seventeen civilized nations (our maternal mortality rate being exceeded only by Belgium, Spain and Switzerland). Also one must not forget the thousands of women that become invalids as a result of puerperal infections; it is said that for every woman that dies five suffer from it.

That the streptococcus is responsible for most of the puerperal infections and especially those ending fatally, is generally known. (Bigger and Fitzgibbon, Colebrook, Harris and Brown.) It is for this reason that all efforts have been directed to the immunization of pregnant and parturient women against streptococcal infections. The first work in prophylactic immunization against streptococcal pelvic infections was performed by Bumm in 1905 with killed streptococci. Of the 5 patients he injected prior to operation for uterine carcinoma 2 died from postoperative shock and hemorrhage, while in the remaining 3, a feverless and smooth convalescence followed. Polano, in the same year, published his results of active immunization in obstetric and gynecologic patients. He obtained the strains of streptococci from patients with erysipelas, scarlet fever, puerperal fever and angina. After centrifuging the ascites broth cultures and killing the organism, he utilized the sediment taken up in sodium chloride solution. By means of this bacterial suspension he succeeded in protecting mice and dogs against fatal doses of streptococci. He then immunized 60 obstetric and gynecologic patients who were operated upon without a death. Although Polano drew no definite conclusions, he considered his results a basis for further work.

Levy and Hamm in 1909, cultivated streptococci from puerperal fever patients (whether from the blood or cervix is not stated) in ascites glycerine bouillon. The sediment of this culture was added to 5 c.c. of immune serum (polyvalent), thoroughly shaken and then allowed to remain for three hours in order for the immune bodies to become fixed to the bacteria. The organisms were then killed by a phenol solution. The mixture was centrifuged and washed repeatedly and suspended in normal saline solution so that each cubic centimeter of the suspension contained 50,000,000 streptococci. One cubic centimeter of the sensitized vaccine was given eight to ten days before delivery. Fourteen pregnant women were immunized by this method. The puerperium was afebrile in all the cases except one, in which a peritonitis occurred following a long labor. The peritoneal infection was secondary to a parametrial abscess due to *B. coli* and *Staphylococcus albus*. Levy and Hamm also used this sensitized vaccine therapeutically but only in a small group of patients, so that no valid conclusions could be drawn from either series.

In 1911, Watters and Eaton reported the use of polyvalent and autogenous vaccines in the active infectious stage. No details were given as to the preparation of the vaccine.

Champtaloup suggested in 1914 the active immunization of expectant mothers against streptococcus puerperal fever when the infection occurs in epidemic forms in institutions or in private practice when the home surroundings are dirty. He used three doses of a vaccine which were given at intervals of two days, in amounts of 100,000,000; 250,000,000, and 500,000,000 organisms.

Further studies of prophylactic immunization were reported by Jötten in 1917. He used six strains of streptococci isolated from the blood of six severe streptococcal puerperal fever patients. The washed bacteria from glycerine agar plates after one to two days' cultivation were utilized, and they were killed by heat. Later, he substituted 1 per cent glucose broth instead of glycerine agar and centrifuged the cultures to obtain the organisms. The bacteria were washed several times with normal saline solution before the final suspension was made and counted. A phenol preservative was added. He immunized 819 women from October, 1915, to April, 1916, injecting 25 to 50 million bacteria prior to parturition. Of this group of patients 131 or 16 per cent developed a fever above 38° C. axillary. From May to July, 1916, 433 pregnant women received 100 million bacteria and 58 or 13.3 per cent developed fever. From August to October, 1916, three hundred pregnant women were immunized with 250 million organisms and 32 or 10.66 per cent de-

veloped fever. From November, 1916, to March, 1917, 126 women were immunized with 500 million organisms and 9 or 7.1 per cent developed fever.

Jötten studied the vaccinated pregnant women serologically to determine the presence of specific antibodies by the bacteriotropine method of Neufeld and the opsonic index method of Wright. These methods demonstrated that a beneficial action resulted from the vaccinations, especially when the larger dose of 500 million streptococci was used. He also employed the method of Koch and Kleine to determine the presence of agglutinins, since these investigators found agglutinins in individuals receiving streptococcal vaccines. The results of Jötten indicated that vaccination with a streptococcus not only conferred an immunity against the puerperal fever strains but also against strains from other sources.

In 1922, Louros, immunized a series of pregnant women with a vaccine of washed streptococci obtained from nine sources (six from the blood of puerperal fever patients, two from surgical streptococcus infections, and one from a patient with erysipelas). One-half cubic centimeter (250,000,000 streptococci) was injected twenty days before the expected labor and 1 c.c. ten days before. No general reaction or increase in temperature was observed but local redness was noted. Of 151 pregnant women which he immunized only one developed a fever (40° C. on the sixth day postpartum) and although the lochia revealed streptococci on culture the temperature dropped and the patient recovered. The blood culture was sterile.

In a second group of 200 pregnant women who were seen after the onset of labor for the first time, Louros injected 1 c.c. (500,000,000 bacteria) of the vaccine and 50 c.c. of an antistreptococcus serum. One woman died of typhus fever, another developed a fever of 40.2° C. on the fourth day postpartum which subsided, and a third woman had a fever of 39.6° C. on the seventh day postpartum which likewise dropped to normal. This investigator considered his good results to be on a sound basis and gave as proof the confirming results of serologic studies. The blood of the patients immunized showed no agglutination in 1 to 50 before injection and six days after immunization an agglutination titer of 1:800. Also, the bacteriotropine test showed a reaction between 1:100 and 1:350. He also employed the agglutination method of Koch and Kleine, and the method of Neufeld for the determination of bacteriotropines.

A control group of 333 women who were delivered by the same methods and technic were followed, and of this number 38 developed puerperal fever, 5 had streptococci in the blood, 10 had local streptococcal infections, and the remainder had putrid infections.

In 1923, at the French Congress on Puerperal Fever, both Brauha and Hauch presented evidence of the value of vaccines in the prophylaxis against puerperal fever.

Haertel, in 1925, utilized Louros' vaccine and method of immunization in the Athens Obstetrical Clinic. In 367 immunized parturients, only 3 developed endometritis and 2 had a fever although 80 operative deliveries were performed. The lochia of these 3 patients did not contain streptococci. In a control series consisting of 786 nonimmunized parturients, including 68 operative deliveries, 24 developed puerperal fever of which number 8 died. Seven of the fatal cases were due to streptococcal and one to staphylococcal infection. He reduced the mortality from 1.3 per cent to 0 and the morbidity from over 37.5 per cent to 3.26 per cent.

In the same year, Louros published more statistics on the active and passive immunization of pregnant women. Of 682, 483 received a simple dose of both serum and vaccine, while 199 received two doses of vaccine. Although 182 developed fever during the puerperium, only 18 had endometritis and none died of puerperal fever. He describes three cases in which the Ruge-Philipp virulence test showed a definite

absence of virulency of the vaginal streptococci in the blood of the immunized woman but the presence of virulency in strange blood. He believed that since the vaginal streptococci became avirulent in the blood after three to four days the immunity became active and this period of negative phase (three to four days) was overcome by the serum. Louros considered the patient protected against a blood infection but not against a local one, i.e., endometrial or parametrial.

It is evident from an analysis of the recent work that from the clinical standpoint vaccination of pregnant and parturient women against streptococcal infection is a valuable measure. The immunologic studies of two investigators, Jötten and Louros, demonstrate the presence of antibodies in the blood of the actively immunized women. However, it should be noted that proper control groups were not studied so that certain inconstant factors as seasonal variations, complications of pregnancy and labor, and individual technics were not eliminated. Furthermore, it is to be observed that all the investigators were careful to wash the streptococci several times before using them, thus eliminating all soluble bacterial products from the vaccine.

With the establishment of toxin production by the *Streptococcus hemolyticus* isolated from the blood of patients with puerperal fever, as reported in June, 1925, by Lash and Kaplan, immediate efforts were made to determine whether an antitoxin could be produced. The demonstration of antigenic properties of the toxin reported in April, 1926, made it possible to use this toxin in actively immunizing women against streptococcal infections. Therefore, it was the purpose of this study to determine whether the addition of toxin to the organisms increased the potency of the mixture utilized to immunize pregnant and puerperal women. Since previous workers have already demonstrated in determining the efficacy of the streptococcal vaccines that the immunologic and clinical curves run practically parallel, it was deemed unnecessary to follow both lines of study. The clinical method was chosen since in the final analysis the true value of any prophylactic or therapeutic measure must be used upon its effect on the patient, as determined by adequately large and accurate statistics. While this work was in progress, studies by Becker and Louros and Scheyer, in 1927 confirmed the early work of Lash and Kaplan on toxin production by puerperal fever *Streptococcus hemolyticus*. The confirmatory evidence was obtained by these investigators by studies with the toxin obtained from the *Streptococcus hemolyticus* from puerperal fever in lower animals demonstrating the antigenic properties of the toxin.

PREPARATION OF STREPTOCOCCAL TOXINS

Fourteen strains of hemolytic streptococci isolated from the blood of patients with puerperal fever which proved to be toxin producers were used. The organisms were grown in plain veal infusion broth (P_H 7.4) for forty-eight hours, at 37.5° C., then heated to 55 or 60° C. for one hour. After shaking to break up the clumps of bacteria the organisms were counted. The toxins from these 14 strains were ob-

tained by growing the organisms for four to six days in the same broth as described above, at 37.5° C. The cultures were then passed through paper pulp and then through Berkefeld N filters. These toxins were found capable of producing an area of redness and swelling 1.0 cm. or more in diameter, in susceptible people when only 0.1 c.c. of a 1-1000 dilution of the toxins was injected intracutaneously. This amount of diluted soluble toxin was arbitrarily chosen as a skin test dose. One cubic centimeter of toxin mixture contained one billion streptococci in 1 c.c. of the undiluted toxins or 10,000 skin test doses. Thus the mixture contained the exotoxin and the endotoxins or toxic substance of the streptococcus. Two per cent sodium ricinoleate was added which according to the work of Larson and his associates based upon a study of scarlet fever and diphtheria toxins, prevents any general reaction.

METHOD OF CLINICAL USE OF STREPTOCOCCAL TOXINS

Unfortunately there is no accurate method to determine the susceptibility of a woman to streptococcal infections, for it is common knowledge that the normal spontaneously delivered woman may develop puerperal fever without apparent cause. The only acceptable method of evaluating the effect of active immunization is to inject in a large series every alternate case and to compare the results.

Frequently the only possible time for immunization was immediately after delivery as some women were not seen until the onset of labor. At first it was considered that the development of immunity in these cases might not occur before the onset of the disease, i.e., four to five days after delivery. In order to determine the optimum time for immunization a group of women were inoculated in the prenatal clinic within three or four weeks before the expected delivery and another group were given the toxins before (three to four weeks) and also immediately after delivery. A No. 22 needle, one and one-half inches long was used. All inoculations were given intramuscularly (left deltoid or left thigh muscles, by one individual). (A. F. L.)

REACTION TO STREPTOCOCCAL TOXINS

Within six to eight hours after the injection which was not painful, the area became tender, then red and swollen. In eighteen to twenty-four hours the area of inflammation measured from 4 to 8 cm. in diameter. This local reaction was more marked when some of the toxins escaped into the skin and subcutaneous tissues. After twenty-four hours the reaction began to subside and disappeared in thirty-six to forty-eight hours. Some tenderness remained for three to four days. In the 1689 injections given, an abscess developed in the arm of one patient and required hot fomentations, incision and drainage. No severe constitutional effects were noted.

To determine whether any constitutional reaction occurred, three series of patients were carefully observed for twenty-four hours for rises in temperature, pulse and leucocyte count. The three series consisted of (1) men, of (2) nonvaccinated puerperal women, and of (3) vaccinated puerperal women. The variation of the pulse, temperature, and leucocyte count in the group of men was negligible. In only one patient of the second group was there a rise in temperature which occurred on the first day of the puerperium due to an acute nasopharyngitis. The leucocyte counts dropped in the majority of the patients. The vaccinated puerperal women developed fever in 3 instances out of 10. There was an increase of only 1000 leucocytes the day following injection in two patients and a drop of as many in a third. In no case did the temperature rise above 102° F. or persist for more

than four to five days. It is not unlikely that the fever was produced by an intercurrent infection. The same, and in some instances, greater variations in the leucocyte counts occurred at twenty-four-hour intervals in both vaccinated and control puerperal women who were afebrile.

The same obstetricians delivered the control and the immunized women, thus avoiding the factor of variation in technique.

McKinley in a statistical study found a seasonal variation in the incidence of puerperal fever. In the series studied in this report, this element does not enter into consideration as the work extended throughout the year.

The influence of a negative phase, which according to Wright follows the injection of a vaccine, was disregarded in this work, because available evidence throws grave doubt upon its occurrence. For instance, Kolmer states in his textbook that most immunologists fail to recognize it. Moreover, were a negative phase to occur, the increased natural immunity found in puerperal women demonstrated by Colebrook and Fry, would tend to have a neutralizing effect. By the time the natural immunity begins to wane, the active immunity following the streptococcal toxins administration could be expected to appear, for Louros found that within six days after inoculation specific antibodies were formed. The opinions of Kolmer and Colebrook and Fry were borne out by my experience in immunizing a group of puerperal women within twenty-four hours after delivery. For in no case was there any clinical evidence of a negative phase occurring after the inoculation with the streptococcal toxins.

The earlier workers used 500,000,000 organisms and found a beneficial effect and no harm resulting. A larger dose was therefore considered in order to limit the immunization to one single injection. Preliminary observations were first made with $\frac{1}{4}$, $\frac{1}{2}$ and 1 c.c. of the toxins. As no general reaction resulted with the smaller doses and because 1 c.c. was used without harm the latter was chosen as the standard dose. The same precautions were observed as in the use of any vaccine or toxin. Only a single injection was made, consisting of 1 billion hemolytic streptococci and 10,000 skin test doses of toxin except in one group of women where two doses of toxins were given.

The control group consisted of 1216 delivered patients, 452 white and 738 negro women varying in ages from fourteen to forty-five years (67 per cent were sixteen to twenty-five years old). Of these, 441 were primiparae and 732 multiparae.

Group I included 1261 delivered mothers who were inoculated within twenty-four hours after delivery. There were 431 white and 830 negro women. Their ages ranged from twelve to forty-eight years, 67 per cent of them being from fifteen to twenty-five years old. Thirty-seven per cent were primiparae and the remainder multiparae.

Group II included 230 delivered women who received one injection of toxins within three to four weeks of delivery, and none after delivery. Sixty-six were white

and 164 negro women, whose ages ranged from seventeen to forty years of age, 75 per cent being between seventeen and twenty-five years. In this group 41 per cent were primiparae.

Group III comprised 198 delivered women, who were vaccinated three to four weeks before delivery and again within twenty-four hours after delivery. Sixty-nine were white and 129 negro women, their age variation being fifteen to forty years, with 65 per cent being between fifteen and twenty-five years.

An analysis of Tables I, II and III, where the incidence of the various predisposing factors to puerperal fever is given, furnishes the follow-

TABLE I. INCIDENCE OF PREVIOUS INFECTIOUS DISEASES

	CONTROL GROUP (1216 WOMEN)	GROUP I (1261 WOMEN)	GROUP II (230 WOMEN)	GROUP III (198 WOMEN)
Puerperal fever	85	86	8	13
Scarlet fever	97	87	21	15
Erysipelas	1	3	0	0
Rheumatic infection	4	11	2	0
Chorea	3	0	0	0
Sore throats	136	145	27	23
Gonorrhea	18	27	2	1
Influenza	80	89	29	18
Pneumonia	51	76	11	16
Typhoid	22	34	5	5
Malaria	18	18	5	3
Diphtheria	40	33	11	5
Syphilis	25	21	0	0

ing significant observations. It is of interest to note the relation between the occurrence of previous streptococcal and other infectious diseases and the incidence of puerperal fever. (Table I.) With the exception of scarlet fever, streptococcal infections confer only temporary immunity and in some individuals a decreased resistance to later infections is produced. (Kolmer.) As this study is chiefly concerned with the comparison of groups of inoculated individuals with a control group, detailed consideration of these various factors will not be made here. It is sufficient to note that there is very little difference in the incidence of the infectious diseases in these groups thereby paralleling the predisposing factors.

TABLE II. INTERVAL SINCE LAST COITUS

	DAYS						WEEKS			MONTHS									
	1	2	3	4	5	6	1	2	3	1	2	3	4	5	6	7	8	9	
Control Group	19	43	16	11	5	1	143	129	83	194	129	86	45	36	30	22	35	66	
Group I	27	45	15	12	4	2	147	147	76	207	186	104	62	29	25	35	75	29	
Group II	3	6	3	4	2	3	24	21	26	24	33	24	12	5	5	1	3	14	
Group III	3	5	3	0	2	0	22	21	20	30	30	15	8	9	5	3	4	8	

As to the incidence of the time interval since the last coitus, it is observed in Table II that there are no marked differences in the various groups. The incidence of recent coitus is far greater than the incidence

of morbidity or mortality due to puerperal fever. However, more detailed analysis of these statistics will be considered later.

Finally, the most important predisposing factor in the occurrence of infection is the labor. In comparing the statistics of the groups (Table III), the incidence of long labors and operations is about the same. Therefore, the various conditions enumerated above, the parallel percentage of the incidence of the usual predisposing factors to puerperal fever and the standard dose of toxins used for the vaccinations, make these statistics lend themselves to proper comparison and allow conclusions to be drawn from the results.

TABLE III. DURATION AND CHARACTER OF LABORS AND DELIVERIES

	CONTROL GROUP	GROUP I	GROUP II	GROUP III
<i>Duration in hours</i>				
1-5	170	199	46	18
6-10	258	318	45	51
11-15	222	209	39	34
16-20	108	105	25	18
21-25	86	70	17	18
26-30	50	37	8	8
31-35	24	14	3	5
36-40	19	26	4	2
41-45	7	6	0	3
46-50	9	4	2	3
51-55	5	4	1	1
56-60	3	2		
61-65				
<i>Operations</i>				
Repair of perineal lacerations, first	137	174	32	27
second	26	41	5	2
third	2	0	0	0
	175	155	26	26
Episiotomies	24	32	3	5
Low forceps	27	14	3	2
Midforceps	3	4	0	0
High forceps	4	6	0	1
Version and extraction				
Manual removal of placenta	3	4	2	0
Uterine packing	6	2	0	1
Manual dilatation of cervix	2	0	1	0
Bag induction	1	1	3	0
Dührssen's incisions	1	3	1	0
Curettage	1	0	0	0
Craniotomy	0	2	0	1
Repair of cervical lacerations	0	4	0	0

The results determined by comparing the incidence of the morbidity and mortality of the various groups are shown in Table IV. Patients having a temperature of 100.4° F. or over between the second and tenth day postpartum were classified under morbidity. The puerperal fever group included those patients with continuous fever for at least four to five days with pain in the lower abdomen, and tenderness over the uterus and broad ligaments and presence or absence of lochial changes.

It is observed that the incidence of morbidity is about the same in all the groups. This observation raises the question whether these temporary rises in temperature are due to true infections of the uterus. In all these patients there were no localizing symptoms referable to the pelvic viscera. It is, however, probable that a mild endometritis may be present without clinical local symptoms, therefore allowing for a certain number of the fevers in the puerperal women to be due to mild uterine infections. But other causes may give the same clinical picture, such as absorption from temporary lochometra, mild pyelitis, upper respiratory infections or breast engorgement or infection. Although there were only four positive smears for gonococci, it is probable that the incidence of latent gonorrhea is much higher. The best means for determining the presence of morbidity would be the finding of inflammatory residuum in the pelvis if the fever remained for several days. It is conceivable that mild endometritis may subside and leave no determinable evidence of an infection.

TABLE IV. INCIDENCE OF MORBIDITY AND MORTALITY

	NO. OF PATIENTS	MORBIDITY PER CENT	*PUERPERAL FEVER PER CENT	MORTALITY PER CENT
Control Group	1216	226-18.6	34-2.8	0
Group I	1261	245-19.4	11-0.87	0
Group II	230	44-19.0	2-0.86	1-0.43
Group III	198	42-21.2	1-0.51	0

(Pulmonary embolism)

*See text for the distinction between puerperal fever and morbidity.

Another explanation for the lack of variation in incidence of morbidity in the different groups may be that the immunity acquired by vaccination with toxins is general rather than local. Also the fevers occurring in Group I may be attributed to the reaction of the vaccination although the experimental groups did not certainly demonstrate this.

That vaccination with toxins is beneficial can be deduced from the definite marked variation in the incidence of puerperal fever in the control and in the vaccinated group. Thus the 2.8 per cent incidence found in the 1216 control patients is reduced to 0.87 per cent in the 1261 vaccinated puerperal women, to 0.8 per cent in the 230 vaccinated pregnant women receiving one dose and to 0.51 per cent in the 198 vaccinated puerperal women who received two doses. Puerperal fever may result from various bacteria but the streptococcus is the commonest and most feared. This fact has been again emphasized recently by Harris and Brown at Johns Hopkins Hospital where in 168 uterine cultures of puerperal fever women, in 113 or 67 per cent streptococci were found alone or in association with other organisms.

It is of further interest to determine the most frequent etiologic factors in the cases of puerperal fever that occurred in these series.

For preventive medicine is indeed of great importance in obstetrics since the achievements of prophylaxis have by far outdistanced those of therapeutics.

In the control group, of the 34 patients with puerperal fever, although no age was exempt, 27 or 79 per cent were under twenty-five years. This high incidence of young women is of no or only slight significance as 69 per cent of the census of the wards was below twenty-five years of age.

The negro women predominated in the ratio of 2.4 to 1. The ratio of colored to white women was 1.63 to 1.0 in the total group, therefore, the difference in the incidence of puerperal fever in the two races cannot be explained on this basis (i.e., ward census). Harris and Brown in their study of puerperal fever statistics found that streptococcal puerperal infection occurred approximately three times more often in the blacks than in the whites, although the two races are approximately equally represented in their wards. They also quoted from some unpublished statistics of J. Whitridge Williams, who found that in the last 5000 deliveries in the Johns Hopkins Hospital, ending November 1, 1927, the incidence of puerperal infection was approximately twice as great among the blacks as among the whites. Harris and Brown attribute this difference in incidence in the races to defective hygienic conditions, poor physical conditions and liability to infections of all kinds. They think that immunity and resistance are not so well developed in the black as in the white race. Kolmer states that well-marked examples of racial immunity are extremely rare although it is believed that negroes are immune to yellow fever and Mongolians to scarlet fever. One may also consider that the patients in this study come from that strata of society where there is only a survival of the fittest. Moreover, it is fair to assume that these individuals who have survived to womanhood have run the gauntlet of the many infections present in their environment and have developed an immunity. Therefore, another etiologic factor alone or in conjunction with that of race susceptibilities or with another factor should be sought.

Primiparae were predominant, and when their number is combined with secundiparae, there is the same incidence as the age period, that is, under twenty-five years of age, or 79 per cent. Although in multiparous women, the local physical defense mechanism is broken, which consists of intact pelvic floor, closed vaginal orifice, normal vaginal flora and closed cervix, yet less trauma occurs to the local tissues for delivery to take place in them than in primiparous.

As to the other factors in the etiology of puerperal fever, one finds that its incidence in the histories of the patients is 8.8 per cent compared to 6.9 per cent in the whole group. Scarlet fever occurred in 8.8 per cent as compared to 7.9 per cent in the complete group. Common sore throats were present in 14.7 per cent as compared to 11.1 per cent

in the total group. A history of gonorrhea or positive smears for gonococci in the present pregnancy had an incidence of 11.7 per cent while in the whole group the incidence was 1.5 per cent. The Wassermann reactions of the puerperal fever patients were negative.

Coitus has always been considered a very important predisposing etiologic factor for puerperal fever. In this series of puerperal infections, 2 patients had coitus two days, 2 one week, 2 two weeks, 3 three weeks, and 22 or 64.7 per cent from one to nine months before delivery.

As to the character of labor in the puerperal fever of the control group, it is found that 26.4 per cent were operative while in the whole group, 6.7 per cent were operative. The difference in the two series is marked.

GROUP I

In this series, puerperal fever occurred in 10 black women and in only 1 white. The age and parity relationship was about the same as in the control group, that is, the majority of the patients were under twenty-five years of age and were either primiparae or secundiparae. Only one patient gave a history of repeated sore throat.

One patient gave a history of coitus three days before delivery, three one week before delivery, one three weeks, and five from two to nine months before delivery. Eight of the labors terminated spontaneously and three operatively.

One death occurred in the entire series of 2905 patients. This patient was in Group II, having received 1 c.c. of toxins one month before delivery. She was a colored woman, twenty years of age, who delivered her first child spontaneously without laceration after a labor of fifty hours and twenty minutes. No vaginal examinations were made. She had no previous infectious diseases. Coitus occurred one week before delivery. Cultures of the cervix postpartum revealed *B. coli* in aerobic cultures and nonhemolytic streptococci in anaerobic cultures. The blood culture was sterile. She ran a moderately septic course from the fifth to the twelfth day postpartum, apparently having an acute metritis and parametritis. A rectal examination was performed to determine the extent of the parametritis. Following this examination, the pulse and respirations became rapid, the patient developed a cold sweat and cyanosis. She died twenty-four hours later with the clinical symptoms and signs of embolism. Permission for autopsy was refused.

SUMMARY AND COMMENT

This investigation to determine the value of vaccination with toxins in pregnant and puerperal women as a prophylaxis against streptococcal puerperal fever was based on the clinical and immunologic evidence of other investigators that some beneficial effect is derived from the use of streptococcal vaccines. Inasmuch as it is established that the toxin produced by the *Streptococcus hemolyticus* obtained from puer-

peral fever patients has antigenic properties, it was added to the vaccine. The resulting mixture contained, therefore, all the streptococcus toxins. The series of patients used in this study presented such parallel incidence as to the various etiologic factors of puerperal fever that, with a standard dose of toxins, they could justifiably be utilized for comparative studies. The effect of the vaccination with toxins was expressed in the incidence of morbidity and mortality. The other variables as seasonal, technic of the obstetrician and the vaccinator were recognized and given due consideration in controlling the work.

The significance of the classification of morbidity is questionable because the presence of an ephemeral fever in the puerperium can hardly be considered as evidence of pelvic pathology in all patients. Morbidity in the puerperium should be classified on the basis of morbid changes occurring in the generative tract as judged by the clinical course and bacteriologic findings. At times, it is realized that this would be difficult in the absence of definite localizing symptoms. In such instances, the diagnosis would have to be made by the elimination of simulating conditions. Therefore, puerperal fever as indicated by acute endometritis and its associated pathology which either heals or leaves definite inflammatory changes in the pelvis and does not cause death would correctly be considered under morbidity. It is for these reasons that Table IV has the statistics under morbidity and puerperal fever.

A temporary fever with no other symptoms or findings may indicate a reaction of the organism to an invasion by a foreign body or bacteria, without the invader gaining a foothold and without morbid changes being produced. Thus, patient R. G. illustrates this statement. She was a Mexican woman, twenty-four years of age, who had had six pregnancies. Following the delivery of one of her children she developed puerperal fever which lasted for two months. The present delivery occurred spontaneously after twenty-four and one-half hours' labor. She received her toxins vaccination within twenty-four hours after delivery (i.e., Group I). On the third day postpartum her temperature rose to 103° C., pulse 96, and she had a headache and a chill. The fever remained for thirty-six hours and then subsided in a few hours. In the cervical culture was isolated a pure growth of *Streptococcus hemolyticus*. There was no tenderness over the corpus or broad ligaments and no visible change in the lochia. It may be properly assumed that this febrile reaction was a definite defense reaction of the body induced by the toxins vaccination against the invasion of the *Streptococcus hemolyticus* isolated from the cervix and uterine secretions. This one case is suggestive but not conclusive as many more such instances would be necessary to be convincing.

Among the various predisposing factors in the development of puerperal fever, the negro race and operative deliveries predominate over the other factors as age, parity, and coitus. A difference in the immunity mechanism in the negro and white races presumed by Harris and Brown finds support in the results of the present study. In Group I 10 of the 11 patients who developed puerperal fever were colored. This fact would seem to indicate a difference in their power to acquire immunity as well as difference in their natural immunity as demonstrated in the control group. Another explanation of this racial variation is the high incidence of gonorrheal infections in the negro race. Although the incidence of positive vaginal smears is low among the negro women of this study, our experience has been that it is very difficult to get positive smears in spite of the presence of the gonococci. It is not an uncommon experience to find that before delivery the smear is negative for gonococci and after delivery either the baby develops an eye infection or the mother runs a low grade puerperal septic course which calls the attention again to the generative tract. At this time the smears will show many gonococci. The presence of a gonorrheal endocervicitis predisposes toward upper genital infections during labor as well as during menses since other organisms are invariably plentiful and usually follow the gonococci.

Operative deliveries are unequivocally a great factor in the production of puerperal fever. This fact is such common knowledge that the above observations merely confirm it. The reasons are quite evident. Resistance to infection is dependent upon the intactness of the epithelial lining and upon the normality of epithelial cells. Therefore, the injury to or destruction of these elements can well explain the deficient local defense mechanism. There seems to be a false notion that if the operator wears sterile gloves and gown, he may invade the generative tract and at the same time forget about traumatism and the ever-lurking bacteria in the vagina or on the vulva.

Another important factor in streptococcal infections is the streptococcus carrier in the medical or nursing personnel. The recent report of Watson and his coworkers has demonstrated the importance of this factor in the production of an epidemic of puerperal fever. After a careful bacteriologic study, this was the only demonstrable factor.

CONCLUSIONS

In the development of puerperal fever there are many unmeasurable factors such as virulence of the bacteria, the local resistance and the constitutional immunity of the patient which play varied rôles in preventing or permitting the disease to occur. However, on the basis of the evidence brought forth by the above controlled study, one is led to conclude that:

1. The use of a streptococcal vaccine has some value toward lowering the incidence of morbidity and mortality in puerperal fever as determined by immunologic and clinical evidence offered by German investigators.

2. The toxic filtrate of hemolytic streptococci from puerperal fever has antigenic properties as demonstrated by the work of Lash and Kaplan, and confirmed by the studies of Becker, Louros and Scheyer.

3. The fact that among 1216 puerperal women there was an incidence of 2.8 per cent of puerperal fever and among 1261 puerperal women vaccinated with streptococcal toxins only an incidence of 0.87 per cent in the presence of parallel variables would indicate the value of vaccination with the toxins as a prophylactic measure against puerperal fever.

4. There was no evidence of a negative phase after inoculation with streptococcal toxins.

5. The lowest incidence of puerperal fever was in the group in which toxins were administered before and after delivery, that is, 0.51 per cent (Group III). This suggests the added advantage of two doses of toxins, one being given three to four weeks before and one immediately after delivery.

6. The negro women have puerperal fever more frequently than the white. This may be explained by the inferior immunologic mechanism of and the higher incidence of gonorrheal infections in the colored.

7. Operative deliveries are more often followed by puerperal fever than spontaneous ones.

8. Since it is not feasible nor necessary to immunize every expectant mother, it is suggested that the pregnant negro women and all pregnant women with probable operative deliveries or with frequent streptococcal infections elsewhere in the body should receive vaccination with streptococcal toxins.

9. Further work should be carried out using multiple doses of toxins in large series of properly controlled cases.

NOTE: I wish to acknowledge the help given me by W. A. Jamieson, Director of Biological Laboratories of Eli Lilly and Company, who was responsible for the frequent allotments of fresh toxins and bacterial suspensions prepared from my strains of puerperal fever streptococci.

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THE PRESENT STATUS OF CESAREAN SECTION WITH PARTICULAR REFERENCE TO ITS EMPLOYMENT IN ECLAMPSIA*

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CESAREAN section can no longer be regarded as a dramatic and tragic procedure, used as a last resort and performed for the greater part on women exhausted from prolonged labor or attempts at delivery. The latter in themselves constituted an additional factor in the excessive mortality which formerly prevailed. The advent of safety has extended gradually and progressively its use for a wide diversity of indications, and these include many pathologic conditions in themselves dangerous to life. It is therefore significant that with these adverse factors a maternal mortality of less than 1 per cent and a fetal mortality of less than 2 per cent is reported by specialists in the larger clinics. In competent hands, the surgical mortality is comparatively negligible. Some have reported from 90 to 100 consecutive cases without a maternal death, and in one instance 145 were reported with one maternal and two fetal deaths. The investigations in two of our larger cities, one north and one south, have shown a wide disparity in the general results obtained, as compared with the experiences of individual operators. In these cities, the maternal mortality was found to be 10 per cent plus, and the fetal mortality 10 per cent. The eclamptic cases reached an unexpected peak of 42.7 per cent mortality, resulting in an especial warning against cesarean section in eclampsia. It appears that those making this survey were so impressed by these adverse findings that in the warning accompanying this report against indiscriminate cesarean section, they still further magnified the operative danger by comparing it with the medical treatment of eclampsia, citing a mortality of less than 5 per cent. As a matter of fact, the average maternal mortality is from 7 to 10 per cent and the fetal mortality from 15 to 20 per cent under nonoperative treatment. A few

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highly skilled obstetricians have reported a maternal mortality of 5 per cent; one series of selected cases coming under treatment early gave a mortality of 1.7 per cent in the medical treatment of eclampsia. As a result of these investigations, the occasional and average operator was especially warned against doing cesarean section, except where delivery by the vaginal route was impossible, not even permitting it to be done where prompt delivery is a requisite for the safety of the mother. More especially is this mandatory when the child is premature or the death of the fetus has occurred in utero. With limits like these placed on the average operator, the surgical mortality rate in his hands will be from 10 to 20 times higher than those of the skilled specialist, because he will only operate on those whose delivery has been attempted, or who have been infected, or who have passed through an unavailing course of medical treatment, or whose vitality is spent, and for whom small hope is left. The obstetric results will also suffer, as both maternal and fetal mortalities will ascend as a result of podalic versions, high forceps deliveries, and embryotomies. Hence there is an open question to be settled, to accomplish which there must come reports from the average surgeon of his work, the indications followed, the results obtained in maternal and fetal mortalities, and finally from follow-ups of the maternal and the fetal morbidity.

Parturition injuries to the pelvic floor and birth palsies are avoided by cesarean section, and maternal and fetal morbidity reduced. In the service of F. G. DuBose and D. H. Doherty at the Vaughan Memorial Hospital and Burwell Infirmary, during the past fourteen years, there have been one hundred consecutive cesarean sections, which have been taken from the records for this report. The indications are detailed in the order of frequency. The foremost includes eclampsia, placental toxemia, nephritis of pregnancy and persistent hyperemesis gravidarum, and may be grouped under nephritis or toxemia of pregnancy. The next group wherein cesarean section is used as a substitute for podalic version or high forceps delivery, includes placenta previa, premature separation of the placenta, massive uterine hemorrhage before the onset of labor from any cause, the senile uterus, elderly primipara, excessive hypertension, and transverse presentation. The third group includes obstruction of the pelvic outlet from deformed or contracted pelvis, uterine or ovarian tumors, cervical or vaginal atresia, malignant disease of the cervix, vagina, or vulva, and excessive adiposis. The fourth, previous cesarean section.

In addition to these, which we have followed, advanced pulmonary tuberculosis and pulmonary edema also are classed among indications by other writers.

Contraindications.—There is almost a uniform agreement among writers that the classic cesarean section is only safe in selective cases. It is to be avoided after the onset of labor; the rupture of membranes,

the attempts at forceps delivery; and more especially after the incidence of infection, as septicemia or peritonitis is an outstanding danger. These contraindications are stressed with an emphasis the validity of which is not borne out by the results in our own clinical operative experience. The frankly infected uteri previous to operation, in our observation, have a better chance following the Porro operation than they have under the medical or the expectant plan of treatment, even though parturition has been accomplished without section in those who were infected previous to or at the time of delivery. Some of these have been saved in our hands, though apparently hopeless, by supravaginal amputation of the uterus, and drainage. Temporary exteriorization of the uterus, especially in the young, where the Porro operation would be a tragedy, has been done with an exceedingly low mortality. The conservation of the uterus in young women with the possibility of future pregnancy recommends it for serious consideration. After delivery by section, the sutured uterus is left on the abdomen, the abdominal wound being closed around it until sepsis has subsided and involution has taken place. It is then replaced within the pelvic cavity.

Technic.—Except in the urgent emergencies, such as hemorrhage or eclampsia, prior to operation the patient should be given a purgative enema; the lower abdomen and vulva shaved and thoroughly cleansed with soap and water; a vaginal douche given, and a 1 per cent mercurochrome solution instilled into the vagina; the bladder emptied voluntarily, or by catheter if necessary, immediately before going to the operating room; thorough infiltration of the abdominal wall with $\frac{1}{4}$ of 1 per cent apothesine solution where the incision is to be made, following the suggestion of Williams, from 5 to 7 inches in length, $\frac{2}{3}$ below and $\frac{1}{3}$ above the umbilicus. After incising the abdominal wall at this point, a small retractor holds the wound open and the parietal peritoneum is anesthetized by injecting, with a long needle, the apothesine solution over an area of 6 to 8 inches from the abdominal incision on both sides. The hand can then be passed between the uterus and abdominal wall without pain to the patient, and the uterus delivered through the incision. If one rotates the uterus laterally, delivers one cornu, then the fundus, and then the other cornu, a smaller incision can be used in the abdominal wall. As soon as it is delivered on the abdomen, the broad ligaments are grasped on either side firmly by an assistant, enabling him to completely control hemorrhage by manual pressure. This grasp is continuous throughout the incision of the uterus, the delivery of the child and placenta, and the final suture of the uterine wound. As soon as the assistant has grasped the delivered uterus as above described, if the abdominal wound is a very long one, it is held together by tenaculum forceps close to the uterus, to prevent intestinal eventration or contamination of the abdominal cavity. One or two gauze rolls are placed above the uterus over the incision, and one long roll is wrapped around the uterus underneath, the assistant's hand grasping it, as an additional precaution against soiling or contaminating the abdominal cavity. An incision about 3 inches in length is made anteriorly in the body of the uterus in the midline, the upper end of which reaches the fundus. With two fingers, this incision is enlarged approximately to 5 inches; the membrane is ruptured, and the child and placenta are delivered and handed to the nurse. As soon as the child cries, the cord is clamped and cut. All shreds

of membrane are carefully removed from the uterine cavity, which is then swabbed with a gauze sponge saturated with 1 per cent mercurochrome solution. The uterine wound is closed in layers. First, a running stitch of plain No. 2 catgut approximating the endometrium; a second running or interrupted mattress suture of No. 2 chromic catgut is placed immediately above this approximating myometrium. A seromuscular running lock stitch of No. 2 chromic catgut closes, and as a rule, completes the suture of the uterine wound. Rarely a few supplementary sutures are necessary to complete the invagination of the serosa. If the uterus becomes flaccid, or shows a tendency to ineffectual contraction while it is being sutured, or at any time before its return to the pelvic cavity, 1 c.c. of pituitrin is injected into the myometrium; to further avoid uterine hemorrhage, a hypodermic of ergot is given before the patient leaves the table. In the high blood pressure, eclamptic, or extremely toxic cases, the uterus is permitted to bleed in order to reduce the pressure and to remove toxic material. A compensatory amount of a 15 per cent glucose and physiologic salt solution is given, from 400 c.c. up to 1000 c.c. as indicated. After removing the gauze rolls from the abdominal wound, it is rarely necessary to mop out blood from the peritoneal cavity as none has entered it. The uterus is dropped back in the pelvic cavity, the omentum is spread over the fundus without traction, and the abdominal wound is closed in layers with catgut up to the skin. Three or four figure-of-eight tension sutures of colloidal linen or silk reinforce the aponeurotic approximation with the lower loop, and take the tension off the skin sutures with the upper loop. The skin is closed usually with non-absorbable colloidal linen in a running stitch, less frequently with an interrupted suture.

The results of this technic have been so satisfactory that the vaginal transperitoneal, the extraperitoneal, and the intraperitoneal-retrovesical cesarean section have not been considered. Nor have we done the transverse incision in the cervix or in the fundus in opening the uterus. The variations from the classic cesarean section just mentioned we commend only to those whose superior surgical skill from an unusually enormous volume of cesarean operations admits of such a versatility in varying the technic. The consideration of the average operator, who does approximately one cesarean section each month, is to perfect himself in one operative technic and adhere to it consistently. In the most of these cases, particularly in the eclamptic and hemorrhagic types, speed is especially essential, and rapidity of operating is not consistent with an unfamiliar and unpracticed technic. From the beginning of the incision in the abdomen until the closure of the uterine wound after the delivery of the child, five or ten minutes is all that is necessary. To close the long abdominal incision in layers with careful coaptation of each layer, ten or twenty minutes are needed.

In the very toxic cases, gastric lavage is done and, following complete emptying of the stomach, from 2 to 6 ounces of magnesium sulphate are given by gavage. As soon as the patient is returned to bed, magnesium sulphate clysters consisting of 3 ounces of a saturated solution are introduced every two hours until liquid stools are obtained through the

rectal tube, or the bowels begin to move freely. Where this laxative effect is delayed, a hypodermic of peristaltin and pituitrin is given as an aid to the above measures.

REPORT OF CASES

This report includes one hundred consecutive cesarean sections since 1915. In these, there have been since 1925, 45 without a maternal death. Local anesthesia was employed in almost every one of these cases. In the previous 55 cases, there were two maternal deaths. There were no fetal deaths where the operation was done after the seventh month of gestation, except where intrauterine death has occurred previous to the operation. One infant just passed the sixth month, weighing two pounds when delivered, survived; and one delivered from a dying eclamptic woman in the early part of the seventh month, weighing four pounds, survived. Over two-thirds of the cases in this series were operated upon because of the toxemia or nephritis of pregnancy, enumerated under the first group of indications, one-half of which had eclampsia. In this group, there were two maternal deaths; one moribund at the time of operation, the other from a cerebral apoplectic stroke four days postoperative.

The next largest number was for placenta previa. Five per cent of the entire group had previous cesarean sections; 3 per cent were elderly primiparas, and 3 per cent were for deformities of the pelvic outlet. One or more came under the several indications outlined above; among these was a dwarf, 51 inches tall, weighing 60 pounds (baby weighed $4\frac{1}{2}$ pounds, 18 inches tall; both survived); another with a ventral hernia and anemia, having a red count of 2,000,000 cells, a young primipara; following the cesarean section, the ventral hernia was repaired during the closure of the operative wound, both mother and child surviving without incident. One was an obese negress, sent to the hospital after forty-eight hours of ineffectual effort on the part of the midwife and doctor to reduce a prolapsed arm in a shoulder presentation, and do a podalic version. On admission the swollen and ecchymotic arm of a dead fetus was protruding from the vagina, the uterus was in tonic contraction and the woman exhausted. Under deep ether narcosis, there was no relaxation of the uterus, and cesarean section was done instead of embryotomy. The recovery of the woman was less eventful than was anticipated. One patient elected this method of delivery, and was supported in her choice by her husband and parents, and only because of their urgent insistence was it done. It is found from case reports in literature, that contracted pelvis first, placenta previa next, and pelvic neoplasm third, is the order of frequency for which the operation has been done.

SUMMARY

In this series, eclampsia and allied toxic state represent over 60 per cent of the causes for which cesarean section was done, with practically no operative mortality, as the 2 fatal cases in this series in reality were not postoperative deaths. It is hard to understand why the mortality of cesarean sections done for the relief of eclampsia should give a mortality of 42 per cent, set forth in one recent survey, as these presented here, for the greater part were referred ones coming into the hospital from 20 to 100 miles away after the onset of the convulsions. Some were infected, some had attempts at forceps delivery, and all of them had been examined by either a physician or midwife many hours before admission to the hospital, and were neither early nor favorable cases.

It is significant that so small a number in this group had pelvic deformities, which speaks well for the absence of rickets in the rural South.

A decade ending in 1905 in my experience with eclampsia, treated nonsurgically, according to the then prevalent methods of elimination, morphine and veratrum, podalic version, high forceps delivery, gave a mortality rate of approximately 10 per cent. Under medical or surgical treatment, relatively equal or competent, the surgical results will greatly surpass the medical.

The average maternal mortality from all obstetric causes during 1925 in six southern states was approximately $\frac{1}{2}$ of 1 per cent (0.478).

Detailed Report of the Two Fatalities:

CASE 1.—Aged thirty-nine years, white. Eclamptic, admitted in profound coma, following eclampsia of two days' duration. Catheterized specimen showed 4-plus albumin, 4-plus casts. Taken to operating room immediately, and under local anesthesia a 4 pound living girl was delivered. The coma deepened, and she died the same afternoon. The child is living. This woman was moribund when she was operated upon, and the living child is the only justification for operating on an extreme subject.

CASE 2.—Aged thirty-five years, white, para iii. Was admitted from another hospital with the following history: Six months pregnant. She was perfectly well until she had influenza ten weeks ago. She has been in bed during the past five weeks, with nausea and vomiting, a daily temperature varying from 99 to 102. For the last two weeks she has been in hospital with persistent nausea and vomiting, terrific morning headache. Tonsils removed one week before admission to this hospital. Patient extremely weak, sallow complexion, circles under eyes; throat shows evidence of recent tonsillectomy, not completely healed, and tongue quite coated. Lungs negative. Pulse rate 110. Heart enlarged two fingers to left, loud systolic blow at apex, transmitted to left. Tender over right kidney and gall bladder. Fundus of uterus just below the level of the umbilicus. Pelvic examination negative except for pregnant uterus.

Urine: Brown in color, acid, gravity 1022, albumin + + +, with quantities of casts.

Blood count: 2,600,000 red cells, 9,000 white cells, 82 per cent polymorphonuclears, 12 small mononuclears, 6 large mononuclears, 65 per cent hemoglobin. Diagnosis:

Toxemia of pregnancy with nephritis. She was kept under observation and treatment for four days, during which time her temperature ranged from 96.4 to 102. On account of the persistent nausea and headache, cesarean section was advised, which was done under ether anesthesia the fourth day after admission. Her postoperative condition was entirely satisfactory until the third day, when she died suddenly from cerebral embolism.

REPORT OF AN EXPLOSION OF ETHYLENE GAS RESULTING IN THE DEATH OF A MATERNITY PATIENT AND HER CHILD*

BY REUBEN PETERSON, M.D., ANN ARBOR, MICH.

IT IS not surprising that fatalities resulting from explosions of various gases used to produce anesthesia should be unreported. No matter how honest he may be, the surgeon refrains from reporting the case, at least immediately, out of regard for the hospital in which the accident occurred. Sudden anesthetic deaths from chloroform and ether have been exploited in the press so long and frequently that such items have ceased to be news. Deaths, however, resulting from explosions of gases used in anesthesia are seized upon by the press and heralded from coast to coast. One only has to be unfortunate enough to be involved in such an accident to realize its sensational features. Letters of inquiry, even telegrams, pour in upon one, many of them phrased in such a manner as to show that the details of the accident have been grossly exaggerated. It is a bad time for the hospital and the surgeon, and neither one is anxious to publish details of the accident.

Again, the surgeon no longer feels competent to pass judgment on defects of anesthesia, so complicated have become the machines of its administration, complicated, that is, for the men whose experience was limited to the open method of giving chloroform or ether. Formerly, having had experience as an anesthetizer in many hundreds of cases, with or without justification, he felt himself quite an expert anesthetizer, and when he began to operate, he had his mind on the anesthetic as well as on the operation. Now all this to an extent has passed. Anesthesia is in the hands of specialists, and the surgeon must depend upon them. When a gas explosion anesthetic accident occurs, he hesitates to report it because he is not quite sure of his ground.

Whatever may be the explanation, the fact remains that there are relatively few detailed reports of deaths from gas explosions during anesthesia. It is to remedy this at least by the report of one case that I have complied with the request of numerous medical friends to give the details of an explosion in the maternity ward of the University of

*Read by title at the Fifty-fourth Annual Meeting of the American Gynecological Society, May, 1929, Old Point Comfort, Va.

Michigan Hospital during the administration of ethylene which unfortunately resulted in the death of mother and child.

The patient was an unmarried girl of sixteen, mentally deficient, first pregnancy, who at 9:40 P.M., November 30, 1927, was well advanced in the second stage of labor. Owing to the strength and frequency of the pains and on account of the marked bulging, ether in slight amounts was given the patient until the arrival of a regular hospital anesthetist who took charge of the ethylene-oxygen anesthesia which for some months had been employed as an analgesic for the maternity patients.

The mixture employed in a McKesson apparatus was ethylene and oxygen, 25 per cent of the former and 75 per cent of the latter. The practice has prevailed with maternity patients to ask them to breathe deeply three times at the beginning of a pain. The mask is then removed from the face and the patient urged to bear down. In the latter part of the second stage when the head is extended over the perineum, it is customary to increase the amount of ethylene and decrease the proportion of oxygen until practically complete anesthesia is produced.

It is essential to keep in mind this technic of administering the ethylene since, as will be shown later, it had a distinct bearing upon the cause of the explosion which occurred after the fourth or fifth administration of the mixture before the proportions of the ethylene and oxygen had been changed.

The explosion occurred at approximately 10:10 P.M. It was violent and loud enough to be heard throughout the four-storied maternity building. The anesthetist was partly blown from her chair but fortunately escaped serious injury. The gas machine was seen to be on fire, but the flames were promptly extinguished by means of a blanket.

Immediately following the explosion the patient cried out and attempted to rise up to sitting posture on the delivery table. After resuming the recumbent position she went into opisthotonus, began coughing up large quantities of foamy blood, and became unconscious.

I was called immediately and arrived in the delivery room within ten minutes after the accident. The table was lowered in the Trendelenburg position to facilitate the emptying from the throat and mouth of constantly increasing amounts of blood. Finally a tracheotomy was performed in the vain hope it might be of some avail. The postmortem findings revealed why nothing could be done to save the patient. Almost immediately after the accident the patient's neck and face became greatly swollen and distorted by a marked emphysema. The heartbeat was at first fairly strong but gradually became weaker until death at 11 P.M.

At the time of the explosion crowning was taking place and the baby would have been born within a few minutes. After the accident the fetal head receded within the greatly relaxed introitus. The fetal heart could not be heard, any possible sounds, however, being obscured

by the patient's noisy respirations. Although it was thought improbable that the fetus was alive, it was deemed advisable to extract it on a chance it might be saved. Forceps were applied one-half hour after the accident and the child easily delivered by slight traction owing to the excessive relaxation present. The fetus showed no signs of life and all attempts at resuscitation were unavailing.

Dr. A. S. Warthin's autopsy findings were as follows: traumatic death, ethylene explosion during anesthesia for childbirth, multiple lacerations of lower trachea, great bronchi and parenchyma of lungs; massive hemorrhages throughout the lungs; interstitial emphysema of upper half of body; fatty degenerative infiltration of liver; subepicardial fatty infiltration with moderate right-sided cardiac dilatation; lipoidosis of adrenals; puerperal changes in uterus with laceration of the cervix; tracheotomy wounds; acute passive congestion of all organs; edema of meninges and brain.

At an investigation of the cause of the explosion made by the committee on anesthesia of the University Hospital assisted by Dr. E. J. McKesson of Toledo, Ohio, Professor Williams of the department of physics of the University of Michigan and Professor C. C. Meloche of the department of chemistry, on December 13, 1927, the following facts were elicited:

1. The rubber pneumatic face cushion was missing, but there were the remains of the celluloid hood under the collar which normally holds it in attachment to the metal parts of the face inhaler.

2. The breathing tube four feet long with a coil of wire running through from one end to the other showed three definitely punched out places where the rubber had previously been in continuity where the explosion had blown out the rubber between the coils of wire, leaving the wire exposed but apparently intact from one end to the other.

3. On top of the head of the mixing valve, the glass window, a circular window of about an inch and a quarter in diameter, had been blown out. The fine glass from this window was thrown to the ceiling by the force of the explosion,

4. The bottom of the rebreathing chamber was blown out together with the rubber glove fastened to this part of the chamber and used for rebreathing purposes.

5. In the breathing tube, a streak within the lumen of the tube about one-sixteenth of an inch wide seemed to travel from one end to the other. This streak looked like charred rubber for it was dark brown in color, and the texture of the rubber at that point was as hard as rubber which has been charred by coming in contact with a high temperature, looks and feels.

Since the explosion and its fatal ending, no ethylene has been used in the department of obstetrics and gynecology. In fact it has been

discontinued throughout the hospital, although its advantages had been appreciated through its employment in nearly 15,000 cases. While I do not favor its use in obstetrics for reasons which will be set forth later and while its disadvantages in regard to nonrelaxation in pelvic and upper abdominal surgery are many, there still remain many cases where it would be the anesthetic of choice because of the prompt recovery of the patient in comparison with ether. Why then should its use be abandoned because of a fatal accident when we know that many patients in the past have succumbed from ether improperly administered? Obviously the answer must lie in the causes of the explosion and whether these can be eliminated. If not, if we cannot be practically certain that an explosion will not or cannot occur in the next case where ethylene is administered, I, at least, do not feel justified in authorizing the use of this anesthetic.

Possibly I am ultraconservative in my preference for methods of anesthesia. Perhaps some of this dislike of present day anesthesia is due to difficulties at once presented when one seeks the cause of the explosion. Like all of you, I have studied physics and chemistry, but I, at least, am far from being a physicist or chemist. And one would feel more comfortable about the whole problem if the manufacturers of the anesthetic machines, the physicists and chemists called in consultation would agree, but they do not. One claims that the cause of this and all similar accidents is the following. Another expert denies this and offers another explanation. I must confess that all this leaves me cold and with a feeling that I shall wait a while before resuming the use of this very inflammable anesthetic agent. However, I have given the problem of what caused the explosion considerable thought, and I give you my conclusions for what they are worth.

Undoubtedly anesthetic explosions of inflammable gas usually come from electrostatic sparks generated from without or within the machine. We all know what happens when we walk across the carpet in our homes in dry winter weather and bring a finger close to the radiator or electric light. The electric charge on our bodies jumps through the air in the form of a spark. This we know but we have had no necessity of applying such knowledge to the operating room where this static electricity may be accumulating. This is because up to a short time ago we were using either nitrous oxide and oxygen which is non-explosive or the drop method of etherization in which ether mixed with the oxygen of the air does not explode, even if conditions for static electricity be favorable.

This comparatively new anesthetic, ethylene, is highly inflammable and explosive when diluted with oxygen, and electrostatic charges are the common causes of the explosions. This has been recognized and provided against in modern hospitals. The methods adopted are well set forth in an article by Dr. Isabella C. Herb, chief anesthetist of the

Presbyterian Hospital, Chicago, published in the Journal of the American Medical Association, December 5, 1925. In brief, the operating room floor, the different parts of the gas machine, the operating table, and the patient are all grounded, so that electrostatic charges will be rendered harmless. Temporarily a sheet of steel was installed in the floor of the operating room, to be replaced by a floor of small squares of terrazo, separated by narrow brass strips.

One can readily see that the expense would prevent most established hospitals from installing such floors in their operating rooms. To put it another way, the hospital authorities probably would object to this extra expense in order to insure the safe use of a very explosive anesthetic mixture provided other safe anesthetics could be substituted. As an example I might cite the University of Michigan Hospital. Here there are eleven operating rooms in constant use on one floor. To install such floors referred to above in anesthetizing rooms, halls and operating rooms which practically have just been built would entail an expense which the authorities would hesitate to authorize unless no other anesthetic but ethylene could be used.

Yet that is not the whole story. As C. H. Wardell, Jr., has pointed out in his article entitled "Minimizing the Fire and Explosion Hazard of Anesthetic Agents," published in the March-April, 1928, issue of *Current Researches in Anesthesia and Analgesia* such grounding devices referred to above are not enough. The operating rooms must be equipped with a humidification system whereby the operating rooms can be maintained at 60 per cent relative humidity, since the chances of electrostatic charges are greatly reduced in such an atmosphere. Yet it may not be amiss to state that when our accident occurred it was a rainy night, with probably a relatively high humidity within the delivery room. At least, the weather was not dry and cool when electrostatic sparks are most easily produced.

Yet even if we have adopted all these precautions to prevent electrostatic discharges, we have not finished. Professor Williams and his coworker on this problem, Dr. Franklin D. Johnston, point out that the greatest danger of static accumulation is on the inside of the rebreathing rubber bag, and they think that the movements of this bag, a rubber glove in the case of our explosion, were responsible for the accident. Professor Williams would substitute a manometric arrangement for the rubber glove while Dr. Johnston would prefer to try the effects of a radio-active substance to avoid static accumulation. Even with these precautions, the human equation cannot be eliminated. For example, undoubtedly after the terrible experience of the Cleveland Clinic disaster, it would be possible to guard against a similar accident, provided those carrying out orders were never heedless or careless. The heads of the clinic cannot go into the basement and see that fire doors are closed or that steam pipes do not leak. Neither can you nor

I find time or have the patience to examine operating room fixtures and anesthetic machines to guard against defective grounding. The probable result will be that a less dangerous x-ray film will be substituted for the one now in use and that for the large majority of hospitals, anesthesia will be accomplished with a less dangerous agent than ethylene.

It must not be forgotten that while nitrous oxide-oxygen mixtures are nonexplosive, the same is not true when ether is mixed with oxygen or when nitrous oxide-oxygen-ether mixtures are administered through any of the anesthetic machines.

The conscientious surgeon is not comforted by the fact that explosions are not likely to occur more frequently than so many times in so many hundreds or thousands of cases if the proper precautions are taken. Unless he is certain that an explosion will not occur in the next case where these explosive mixtures are employed, he will use another anesthetic free from the possibility of explosion if ordinary precautions are employed. This course I have been obliged to pursue since I abandoned ethylene. I must say that my present frame of mind toward general anesthesia is so free from anxiety, and the results are so satisfactory, that I shall have to be convinced that all dangers have been removed from the administration of explosive gases through anesthetic machines, before I shall change my present anesthetic technic which is as follows: The induction is made with nitrous oxide-oxygen mixture. This anesthetic is continued for short operations. For longer operations or for abdominal or pelvic work where relaxation is desired, the anesthetist turns to the open mask drop ether method, no ether mixture being allowed in the gas machine. Toward the close of other than short operations nitrous oxide-oxygen anesthesia may be resumed at the direction of the operator who notifies the anesthetist that from the operative standpoint ether is no longer needed. Here again no machine ether mixture is allowed.

In obstetric work, ether on the open mask is the anesthetic of choice. I have employed this method for obstetric analgesia and anesthesia for years with best of results. I have no objections to chloroform, but it is not quite as safe as ether, and experience should be gained in the use as far as possible of one anesthetic. In tropical climates for obvious reasons one must use chloroform in preference to ether.

May I also make a plea for the use of ether administered by the simpler methods on the ground that the student should be taught a simple effective method of general anesthesia, since only about 40 per cent of deliveries occur in hospitals. Only under exceptional circumstances can complicated gas machines be taken to private houses. Let us not do anything to make the practice of medicine any more complicated than it is only too rapidly becoming.

SUMMARY AND CONCLUSIONS

1. Ethylene is an exceedingly inflammable and explosive gas when mixed with oxygen or ether.
2. Explosions may occur in the use of this anesthetic through electrostatic charges unless extraordinary precautions are taken to see that everything that has to do with anesthetic machine and surroundings is grounded.
3. Even then, there is a possibility of an explosion from within the gas machine as it is at present built.
4. It would seem best for the present at least to return to the use of nitrous oxide-oxygen gas and of ether given by the drop method, no ether mixture being allowed in the gas machines.
5. A return to simpler methods of anesthesia will enable the student to be instructed better in general anesthesia and make it possible for the surgeon to control anesthesia or at least to keep in close touch with the anesthetist during its administration.
6. The open mask administration of ether is best for analgesia and anesthesia in the second stage of labor.
7. In obstetrics complicated methods of anesthesia should not be taught to undergraduates or interns. The simple methods will be more useful for deliveries in private homes where about 60 per cent of deliveries still occur.

DeGaris, Mary: Painless Labors—Their Occurrence, Their Interpretation and Their Adoption as a Standard, Brit. M. J. 2: 745, 1928.

A résumé of the literature and also fourteen histories of recent cases are presented. Some obstetricians deny the possibility of painless labors in a healthy woman. MacKenzie's theory that pain is a viscus-sensory reflex occurring during labor is well accepted.

Painless labors are classed as (1) pathologic labors, tabes, toxemias, etc.; (2) normal painless labors, healthy women, (a) type resembling defecation, (b) sleeping labor.

The symptoms are the same as in an average labor, even to fatigue which occurs not uncommonly. The doctor or nurse may pay little attention to the mother's sensations and she is not always certain of the impending condition.

The absence of pain is not sufficient to brand a labor as abnormal, it may be unusual but it is not necessarily pathologic. Since the uterus is like the other hollow viscera, and has the same physiology, why should all uterine contractions be painful? Why consider pain as a necessity to childbirth? Why not seek the cause of pain rather than that of its absence? It might be possible to bring the pains of labor under control by dealing with the cause instead of using palliative methods, such as anesthesia.

ADAIR-HESDORFER.

PROLIFERATIVE OVARIAN TUMORS

A CLINICAL AND PATHOLOGIC STUDY OF 435 CASES TREATED BETWEEN
1875 AND 1928 AT THE CLINIC OF THE FREE HOSPITAL FOR WOMEN

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DERMOID cysts or ovarian teratomas, pseudomucinous cystadenomas, benign papillary serous cystadenomas, malignant papillary serous cystadenomas or ovarian carcinomas, fibromas, sarcomas and ovarian endometriomas are the usual proliferative tumors of the ovary. Between 1875 and 1928, 522 cases of proliferative ovarian tumor or tumors have been treated at this clinic, and of these, 85 have been private cases of Drs. William P. Graves and Frank A. Pemberton, treated between 1902 and 1928. Table I shows the distribution of the tumors.

TABLE I

DISTRIBUTION OF TUMORS	NUMBER OF CASES
Dermoid cysts alone (5 were bilateral)	97
Pseudomucinous cystadenoma of one ovary and bilateral dermoid cysts	2
Pseudomucinous cystadenoma of one ovary; dermoid cyst of the other	1
Benign papillary serous cystadenoma and dermoid cyst of same ovary	1
Pseudomucinous cystadenomas alone (8 were bilateral)	108
Pseudomucinous cystadenoma of one ovary; fibroma of other	3
Pseudomucinous cystadenoma and sarcoma of same ovary	1
Pseudomucinous cystadenoma of one ovary; sarcoma of the other	1
Benign papillary serous cystadenomas alone (21 were bilateral)	70
Benign papillary serous cystadenoma and fibroma of same ovary	1
Benign papillary serous cystadenoma of one ovary; fibroma of other	1
Benign papillary serous cystadenoma and fibroma—bilateral	1
Benign papillary serous cystadenoma of one ovary; endometrioma of other	1
Carcinomas alone (41 were bilateral)	84
Carcinoma of one ovary; endometrioma of other	3
Bilateral carcinoma; sarcoma of one ovary	1
Bilateral carcinoma; bilateral fibroma	1
Fibromas alone (4 were bilateral)	47
Bilateral fibromas; fibrosarcoma of one ovary	1
Sarcoma alone	10
Bilateral endometriomas	34
Unilateral endometriomas	53
Total number of cases	522
Total number of tumors	665

Since the ovarian endometriomas have been reviewed in a recent paper (AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY 17: 806, 1929), they will not be analyzed in this report. The very frequent finding of beginning papillary growth in their walls, however, and their more than occasional association with ovarian carcinomas should be emphasized as indicating a possible etiologic relationship.

In classifying these tumors no difficulty was encountered with the dermoids, fibromas or sarcomas. The cystadenomas, on the other hand, were very difficult to group and some cases, of necessity, were placed more or less arbitrarily. A definite decision as to whether some papillary cystadenomas were benign or malignant could not be made, even though the operative findings, the pathologic picture, and the results were carefully studied. Similarly, it was at times practically impossible to decide whether a cyst was of the pseudomucinous or serous type, for elements of both could be found. Furthermore, in a number of instances it could not be determined whether the malignant ovarian cyst was pseudomucinous or serous in origin or neither.

DERMOID CYSTS OF THE OVARY

Since the mesoderm and entoderm as well as the ectoderm are represented in these tumors, teratoma is the more correct term. Dermoid, however, is more usual. This report covers 101 cases.

Family History: tuberculosis, 6.9 per cent; malignant disease, 6.9 per cent.

Past History: 26 patients had had previous operations, of which 17 had been pelvic. Two had had an ovarian tumor removed.

Age on Admission: youngest, fourteen; oldest, sixty-five; 63.3 per cent were between the ages of twenty-four and forty inclusive.

Marital Condition: unmarried, 22.7 per cent; sterile, 16.1 per cent. The average number of pregnancies per married patient was 3.7; of children, 3.1.

Menstruation:

Before puberty	1	Essential dysmenorrhea	5
Past the menopause	11	Acquired dysmenorrhea	28
Menopause before forty-five	5	Menorrhagia	14
Dysmenorrhea worse on same side as tumor	6	Metrorrhagia	13

Complaints:

Backache	24	Flowing	6
Pain in right side	22	Flowing after menopause	2
Pain in left side	22	Sterility	3
Pain in lower abdomen	20	"Falling of womb"	10
Swelling of abdomen	11	Attacks of right-sided pain	4

One patient, whose seven-centimeter cyst had a twisted pedicle, had had pain in the left side increasing in severity for six days. In 40 per cent of cases the symptoms were directly referable to the quadrant in which the dermoid was found, despite the fact that some of the tumors seemed too small to make their presence known.

The duration of symptoms varied from a few weeks to over ten years. In the majority of cases the duration was less than three years.

OPERATIONS AND RESULTS

Ovarian resections were performed on 5 patients. Three are untraceable. One patient was four months' pregnant and well two years later; another was well twenty years later.

Unilateral oophorectomy was performed on 52 patients. Fourteen are untraceable. Operative deaths, 2 (circulatory collapse, patient aged 60; pneumonia, patient aged thirty). Four patients died from seven months to twenty-nine years after operation—pneumonia, criminal abortion, influenza, and nephritis. Thirty-two patients were well from six months to twenty-five years later. Five had had 12 normal pregnancies and deliveries. A sixth patient, who had had a tubal pregnancy on the same side as the dermoid, had a second tubal pregnancy excised six years later and was well fourteen years later. Four other patients had later operations—cholecystectomy, 2; radium for flowing, 1, and excision of cyst of remaining ovary, 1.

Supravaginal hysterectomy and bilateral oophorectomy were performed on 39 patients. Eight are untraceable. Five patients died from three months to nine years later—metastatic carcinoma of endometrium, pneumonia, nephritis, carcinoma of the colon, and appendicitis. Twenty-six were well from one to fifteen years later. Two of these complained of excessive obesity.

Complete hysterectomy was performed on 2 patients. (Carcinoma of endometrium and dermoid.) One is untraceable. The other is well six years later.

Vaginal section and drainage (1878) were performed on 1 patient. The patient died of carcinoma of the breast thirteen years later.

Drainage through rectum for dermoidrectal fistula (1882) was performed on 1 patient. The patient was improved six months later.

Two-stage unilateral oophorectomy was performed on 1 patient. Patient died of shock following second operation. The tumor was dumb-bell-shaped, 24 centimeters in greatest diameter, one locule being in the pelvis, the other extending through the greater sciatic foramen and distending the buttock.

PATHOLOGY

The tumors revealed nothing unusual. Entodermal derivatives were only rarely found. There was no ovarian malignancy. In 28 cases the dermoid was an incidental finding, the operation being performed for prolapse, fibroids, pelvic inflammation, carcinoma of the endometrium, flowing, and tubal pregnancy. In these cases the tumors were small and usually gave no symptoms directly referable to the ovary. On the other hand, there were a few cases in which the dermoid, though small and nonadherent, seemed to cause one-sided pain.

The tumors were bilateral 8 times. In 2 of these one was a part of a large pseudomucinous cyst and in a third one was part of a fifty-pound simple serous cyst. In 2 cases the dermoids were a part of large benign papillary cysts. The size of the dermoids varied from 1 to 35 centimeters; 83 per cent were between 3 and 12 centimeters in greatest diameter.

In 32 instances there were adhesions between the tumor and surrounding structures. These were usually not dense. The cyst was ruptured at operation 3 times, with no ill consequences from spilled contents. Fibroids were found in 15 patients (14.8 per cent), and gallstones were found in 4.

SUMMARY AND CONCLUSIONS

1. Abnormality of menstruation was present in 51.6 per cent of patients.
2. Eight patients had benign ovarian cysts in addition to the dermoids.
3. The operative mortality was 2.9 per cent.
4. The results of operation, in the absence of other pathology, were uniformly good since only 2 patients had later pelvic operations.
5. In 7 patients there occurred after operation 15 pregnancies of which 12 resulted in normal labors.
6. Malignant ovarian disease in this series was conspicuous by its absence.
7. In the absence of other pathologic conditions the treatment of ovarian dermoids should be operative and as conservative as possible.

* * * *

PSEUDOMUCINOUS CYSTADENOMA

There were 116 cases with this type of tumor. In 23 instances, before 1902, the diagnosis was not confirmed microscopically, so there is probably a small percentage of error in the following figures.

Family History: tuberculosis, 6 per cent; malignant disease, 4.3 per cent.

Past History: 6 patients were tapped one or more times before operation.

Age at Operation: youngest, eighteen; oldest, seventy-three. Forty-three, 34.7 per cent, were between forty-five and fifty-five years old.

Marital Condition: unmarried, 24.3 per cent; sterile, 16 per cent. The average number of pregnancies was 3.3, of children, 2.7.

Menstruation:

Past the menopause	37	Irregular menstruation	23
Menopause before forty	4	Dysmenorrhea	11
Menopause before forty-five	16	Menorrhagia	2
Flowing after menopause	10		

Complaints:

Swelling of abdomen	81	"Falling of womb"	5
Pain in lower abdomen	58	Pressure in pelvis	5
Backache	19	Flowing	5

In 84 cases the duration of symptoms was less than three years.

OPERATIONS AND RESULTS

Resections of ovary were performed on 2 patients. One was untraceable. One was well four years, five months later.

Unilateral oophorectomy was performed on 47 patients. Operative deaths, 4 (2 of surgical shock and 2 of peritonitis, all before 1900). Fourteen were untraceable. Six patients died from eight months to thirty-one years later—recurrent malignant pseudomucinous tumor, pneumonia, "dysentery," "arteriosclerosis," cerebral hemorrhage, and "old age." Twenty-three patients were well from six months to thirty years later. Four had had eight pregnancies, seven of which resulted normally. One had a hysterectomy for fibroids twelve years after operation and was well four years later.

Supravaginal hysterectomy and bilateral oophorectomy were performed on 64 patients. There was 1 operative death in 1881—surgical shock. Twelve were untraceable. Nine patients died three months to twenty-six years later, recurrent carcinoma of the endometrium, recurrent malignant pseudomucinous tumor (4 cases), nephritis, "arteriosclerosis," "colitis," and cerebral hemorrhage. Two are living with recurrence less than one year after operation. Forty patients were well from six months to fifteen years later, 1 having had an operation for "carcinoma of the rectum" five and a half years later.

Complete hysterectomy was performed on 3 patients. One died of recurrence of the ovarian tumor one year, four months later. The second patient, with carcinoma of the cervix also, had a recurrence but was living one year, three months after operation. The third, with carcinoma of the endometrium, was well six months later.

PATHOLOGY

The typical pseudomucinous cystadenoma is a large, ovoid, white, yellowish white, pale or gray blue tumor with a smooth surface which is bumpy due to the contained locules. Though the tumor does occasionally consist of one locule (12 of this series were unilocular) or a few locules, it is most often made up of at least 20 or more which vary in diameter from microscopic dimensions up to 20 centimeters or more. The contents are characteristically colorless, translucent, and slimy. They may, however, be of a watery consistency (6 of this series contained serous fluid) or may form a firm gelatinous coagulum. Instead of colorless they may be opalescent, dirty yellow, olive green, brownish red, or some intermediate shade.

Microscopically the typical picture is of a fibrous cyst wall on the inner surface of which is a single layer of tall columnar cells with clear cytoplasm and basal nuclei. Sometimes the cells contain a globule of pseudomucin. Occasionally there are tufts made up of cells or fibrous papillae covered with them. (Twenty-eight cysts of this series were

papillary.) At times there may be seen in the same section, especially when papillae are present, cuboidal cells with central nuclei and pink cytoplasm. These are characteristic of the serous cystadenomas and make a definite diagnosis difficult. When these cysts are malignant, the cells most often do not show their pseudomucinous character, the diagnosis being made by the finding of characteristic epithelium in another portion of the tumor.

These cysts are usually larger and contain more locules than the serous type; in this series the smallest was 2 centimeters in greatest diameter, the largest, 55. Seventy-seven, 62 per cent, were between 15 and 35 centimeters. It is common for their pedicles to be long and well developed. More or less twisting is usual, but in this series no acute symptoms from twisted pedicle occurred. More or less necrosis, however, was not uncommon. Adhesions, usually not dense or extensive, were found in 51.7 per cent of cases.

Fifteen cases of pseudomucinous cystadenoma, 12.9 per cent, had definitely malignant tumors. There were 4 other cases the gross findings and clinical course of which indicated a benign growth, although microscopically it was impossible to demonstrate that the tumors were definitely benign. They were of very low malignancy. Three of the 15 patients with frankly malignant tumors had bilateral tumors, but the disease was so far advanced that it seemed probable that one ovary was involved secondarily. Five more had metastasis at the time of operation. These all died of recurrence. Two others are untraceable. The remaining 5 were well from one to sixteen years after operation. In all these there was no metastasis found at operation and in all but 1 the tumors had been removed intact without rupture. In this 1 patient, well sixteen years later, the tumor had been ruptured and it appeared malignant under the microscope. Either there had been no viable cells in the spilled contents or the patient exhibited a spontaneous resistance. At a supravaginal hysterectomy for fibroids eleven years later there was no evidence of any recurrence.

Pseudomyxoma peritonei found in 2 of the malignant cases demonstrated a diffuse myxomatous peritoneal implantation. Three benign cases showed this condition. There were 2 operative deaths (before 1900); the other is apparently well one year, six months after operation.

Ascites occurred in 5 malignant and in 6 benign cases.

Rupture at operation: In 19 benign cases the tumors were found ruptured on opening the abdomen or when the trocar was used at operation, or were ruptured unintentionally due to the presence of necrosis and adhesions. Follow-ups from six months to thirty-one years indicated no later ill effects. With the exception of the 1 case mentioned above, metastasis was already present at the time of rupture in those with malignant cysts.

ASSOCIATED PATHOLOGY

Fibroids	23	Diffuse uterine endometrioma	4
Endometrial polyp	8	Fibroma of opposite ovary	3
Procidentia	6	Bilateral dermoid cysts also	2
Cervical polyp	4	Carcinoma of endometrium	2
Nineteen-pound simple serous cyst of other ovary			1
Sarcoma of same ovary			1
Sarcoma of other ovary			1
Dermoid of other ovary and carcinoma of endometrium			1
Carcinoma of the cervix			1

SUMMARY AND CONCLUSIONS

1. The opposite ovary was normal in 87 per cent of cases. In 3 other cases malignant involvement of the other ovary was probably secondary.
2. There were 5 operative deaths, all before 1900 (4.3 per cent).
3. Malignant pseudomucinous cystadenoma was diagnosed in 12.9 per cent of this group.
4. There is evidence that some of the malignant tumors were originally benign.
5. At the time of operation 20 patients of this series, 17.2 per cent, had malignant disease in the pelvis—cervix, endometrium, and ovary. Another patient had carcinoma of the rectum at a later date.
6. In the absence of other pathology conservative operation gave just as good results as radical, i.e., the patients were cured symptomatically and no further ovarian trouble developed. Furthermore, 4 of these patients had eight pregnancies, seven of which were normal.

* * * *

BENIGN PAPILLARY SEROUS CYSTADENOMA

These tumors are characterized grossly by a thin, pale blue wall which is often necrotic and adherent to surrounding structures, by being generally smaller than the pseudomucinous cysts and by their proclivity to burrow between the leaves of the broad ligament. They are frequently bilateral—in 29.4 per cent of this series of the time of operation. Their contents are most often serous or watery and of a color varying from pale yellow to brown or red depending on the amount and kind of blood pigment. Their lining may be nearly all smooth with the exception of a few localized or scattered, pale white papillae less than 1 centimeter in diameter, or it may be covered with many small granular or large fungating excrescences which grossly make malignancy seem probable. In some cases the cyst is filled with a fungating, necrotic, friable mass. Microscopically the fibrous cyst wall, often showing hyaline degeneration, extends into the cyst in the form of tough papillae of varying sizes and shapes. These are covered with a single layer of cuboidal cells with central nuclei and pink-staining cytoplasm. These cells may be heaped

up in places, especially at the bases or tips of papillae. They may also show ciliation which is regarded as a sign of potential malignancy. It is sometimes difficult to determine whether a given tumor is definitely benign or of low malignancy, especially as the microscopic picture may vary in the same tumor. This report deals with 74 cases of this type of tumor. In every instance the diagnosis was confirmed microscopically.

Family History: tuberculosis, 6 per cent; malignant disease, 8 per cent.

Past History: oophorectomy for cyst, 2 cases; hysterectomy without removal of ovaries, 1 case.

Age on Admission: youngest, seventeen; oldest, sixty-nine. There was no marked incidence at any age in this group.

Marital Condition: 15 per cent were single; 17.7 per cent were sterile. The average number of pregnancies was 2.3, of children, 1.7.

Menstruation: 30.1 per cent of patients had passed the menopause. Dysmenorrhea was complained of by 29.4 per cent, irregular or profuse menstruation by 39.4 per cent.

Complaints:

Swelling of abdomen	25	Pain in right side	7
Pain in lower abdomen	17	"Falling of womb"	9
Backache	14	Flowing after menopause	5
Pain in left side	9		

The duration of symptoms was less than three years in 65 per cent of cases.

OPERATIONS AND RESULTS

Exploratory laparotomy and biopsy were performed on 1 patient.

This patient had abdominal swelling and marked uterine prolapse. On opening the abdomen free fluid was encountered and the peritoneum was covered with papillary excrescences. There were bilateral ovarian masses in the pelvis, which were densely adherent. Grossly it was the picture of advanced ovarian malignancy. A specimen was taken for biopsy and the incision closed. The specimen was found to consist of fibrous tissue covered with a few inactive, low cuboidal cells. The patient is alive and working twelve years, three months later. If the biopsy had not shown the growth to be benign, this case would have passed as an example of spontaneous cure. I have been unable to find a single case of advanced ovarian, or any other malignancy that has undergone spontaneous cure when the microscopic picture was undoubtedly malignant.

Twelve years, eight months after operation this patient was brought to the hospital in extremis and died of intestinal obstruction. She had refused treatment. Postmortem abdominal exploration revealed widespread adhesions. The uterus was completely atrophied; the ovaries could not be identified. There was no gross or microscopic evidence of the previous tumor.

Ovarian resections were performed on 7 patients. One is untraceable. The others were well four months to ten years later. There was 1 normal pregnancy.

Unilateral oophorectomy was performed on 19 patients. Four are untraceable. One patient died one year later after a third operation for

severe pelvic inflammation. Fourteen were well from ten months to nineteen years later. There was one successful pregnancy.

Supravaginal hysterectomy and bilateral oophorectomy were performed on 43 patients. There were 2 postoperative deaths from peritonitis. Six are untraceable. Five died one and one-half to seventeen years later—cerebral hemorrhage, "heart disease" (2 cases), pneumonia, and "arteriosclerosis." One of these had been operated on successfully for intestinal obstruction four years, four months after hysterectomy. Thirty patients were well from five months to twenty-three years after operation, 1 patient having had a breast amputated for carcinoma six years after operation.

Complete hysterectomy was performed on 4 patients. One died of carcinoma of the cervix eight months later. The others, who had had carcinoma of the endometrium, were well eight months, six years and fourteen years later.

PATHOLOGY

There were adhesions of the tumor to surrounding structures in 61.6 per cent of cases. They resulted in rupture of the cyst in 5 cases. Follow-ups for from seven to nineteen years indicate that spilling of benign cyst contents has no ill effect.

In 7 cases the cyst contents were of the pseudomucinous type. It is of interest that the epithelium of 3 of these tumors showed an activity that approached a low grade of malignancy more than in the cysts with serous contents—except for 2 whose epithelium was ciliated.

A twisted pedicle was found at operation 4 times. There had been no acute symptoms demanding immediate operation.

Eight of the cysts were monolocular; the remainder consisted of at least two locules. As contrasted with the pseudomucinous cysts, however, the serous cysts were "pauci-locular." They varied in size from 2 millimeters to 30 centimeters in greatest diameter, 24.7 per cent being over 15 centimeters.

In 2 cases there were papillary excreescences on the outer surface of the tumor; in 2 others there were implants on the peritoneum. These patients were well three months to fifteen years later,

Ascites was found three times. It did not effect the prognosis as to cure.

ASSOCIATED PATHOLOGY

Fibroids	26	Fibroma of opposite ovary	1
Endometrial polyp	4	Bilateral fibroma of ovary	1
Cervical polyp	3	Fibroma of same ovary	1
Discrete uterine endometrioma	2	Dermoid of same ovary	1
Diffuse uterine endometrioma	1	Carcinoma of the cervix	1
Endometrioma of opposite ovary	1	Carcinoma of endometrium	3

SUMMARY AND CONCLUSIONS

1. Menstrual abnormality was complained of by 68.8 per cent of patients.

2. Bilateral tumors developed in 30.6 per cent of cases.

3. In 25 instances the finding of a benign papillary cyst was accidental, the operations being performed for prolapse, fibroids, carcinoma, pelvic inflammation, dysmenorrhea or sterility.

4. The operative mortality was 2.7 per cent.

5. Thus far the results of conservative operation have been as satisfactory as those of radical operation. Two normal pregnancies occurred. However, the tendency of these tumors to become bilateral should be remembered when conservative operation is contemplated.

6. Spilling of the cyst contents in 4 cases had no early or late ill effect.

7. Malignant disease was present at operation, or developed later, in 6.8 per cent of cases.

8. Although these tumors are morphologically related to and sometimes the forerunners of the malignant serous cysts, as yet no patient of this group, treated conservatively, has been known to develop a malignant cyst.

* * * *

MALIGNANT PAPILLARY SEROUS CYSTADENOMAS

As already indicated these cysts have features in common with both the malignant pseudomucinous and the benign serous cysts. This is not remarkable since in the ovary all epithelial elements and their derivatives have the same ancestry. This group includes 87 cases of malignant papillary serous cystadenoma, 1 of intra cystic solid carcinoma, and 1 solid carcinoma. In all but 3 cases the diagnosis was made or confirmed by microscopic examination.

Family History: tuberculosis, 6.8 per cent; malignant disease, 6.8 per cent.

Past History: 1 patient had had a hysterectomy without removal of ovaries at the age of forty-one; 4 patients had been tapped.

Age on Admission: youngest, twenty-two; oldest, eighty-six. Over half were between the ages of forty and fifty-five.

Marital Condition: 23.5 per cent were single; 23.5 per cent were sterile. The average number of pregnancies was 3.8, of children, 2.

Menstruation: 33.7 per cent had passed the menopause, this occurring in 4 cases at the ages of thirty-four, forty-two, forty-four and forty-five respectively. Of the remainder 45.7 per cent had some menstrual abnormality.

Complaints:

Swelling of abdomen	57	Flowing	7
Pain in lower abdomen	40	Pain in right side	6
Flowing after menopause	7	Pain in left side	5

The duration of the complaint was less than one year in 47 per cent of cases, less than two years in 66 per cent.

OPERATIONS AND RESULTS

One patient died two weeks after admission. Autopsy revealed the ovarian disease.

Exploratory laparotomy only, the disease being found too advanced for further procedure was done on 10 patients. There were 2 operative deaths, of surgical shock (1886 and 1896). Two are untraceable. Five died of recurrence one month to five years, five months later. One patient with advanced disease but no ascites was alive three years after operation.

Unilateral oophorectomy was performed on 16 patients. Operative death, 1—surgical shock. One is untraceable. Nine died of recurrence less than four years later. One of these had had a cyst of the other ovary removed. One patient died of "angina pectoris" four years, five months after operation. There were 2 with recurrences living a year and a half later. Another with a recurrence was alive six years, four months after operation, having had tumor of the other ovary removed. One patient was well three years later.

Bilateral oophorectomy was performed on 9 patients. There were 3 operative deaths, before 1897, due to sepsis and peritonitis. The others died of recurrence less than two and a half years later.

Supravaginal hysterectomy and bilateral oophorectomy were performed on 49 patients. Four died of surgical shock. Four are untraceable. Seventeen died of recurrence less than three and one-half years later. Five with recurrence are living one to three years later. Nineteen patients were well from six months to thirteen years after operation—10 of these had passed the five-year interval.

Complete hysterectomy was performed on 4 patients. Three are untraceable. The other died of recurrence seven years, seven months after operation.

PATHOLOGY

It is necessary to emphasize again the difficulties of classification and of arriving at a conclusion as to whether or not a borderline case is malignant. In one instance some definite pseudomucinous cells were found in the same tumor along with the typical picture of benign papillary serous cyst and with papillary adenocarcinoma. In 7 cases the cyst contents were pseudomucinous, not serous, but the microscopic picture was characteristic of the serous cystadenomas. Three of these were graded as borderline or very low malignancy; the patients were well four to ten years after operation. In all cases the grade of malignancy, based on the microscopic appearance, varied greatly not only in

different tumors but even in the same tumor. This was demonstrated to some extent clinically, for the length of life of patients with equally poor prognoses at the time of operation varied markedly. In some instances the picture of typical benign, papillary cystadenoma was found beside that of papillary adenocarcinoma; in other instances, usually more advanced cases, no stages suggesting transition from a benign to a malignant condition could be found. The 2 patients with solid carcinoma microscopically were well five and eleven years respectively after operation. At operation they both had ascites but no evidence of metastasis, and the tumors were removed intact.

The greatest diameter of the smallest cyst was 3 centimeters, of the largest, 50. Thirty-six per cent were over 15 centimeters in greatest diameter. Although they were mono- (7), bi- (3) and multilocular (79), none consisted of over 15 to 20 locules. Like the benign, papillary cysts they were paucilocular as compared with the pseudomucinous cysts. The serous contents varied from clear and transparent to opalescent and cloudy and their color was of all shades from pale yellow to green, brown, and red. Varying amounts of friable, dirty white, papillary fungus growths were contained.

Adhesions of the tumor or tumors were present in 89.7 per cent of cases. These were most often extensive and dense making the removal of an intact cyst extremely difficult. Furthermore the cyst walls were often necrotic, a condition which probably antedated the adhesions.

The tumors were bilateral in 43 cases, or 48.3 per cent. These were found often enough in cases without extension or metastasis to indicate that the growth was primary in each ovary, unless the possibility of blood or lymph metastasis be considered.

ASSOCIATED PATHOLOGY

Fibroids	25	Carcinoma of endometrium	2
Endometrial polyp	5	Double uterus	1
Endometrial polyp of other ovary	3	Complete vaginal atresia	1
Diffuse uterine endometrioma	2	Sarcoma of same ovary	1
Endometrioma of posterior wall of uterus			1
Bilateral ovarian fibroma			1

In the 2 cases of both ovarian and endometrial carcinoma neither carcinoma was secondary to the other so far as could be determined.

At the time of operation the prognosis was poor in 68 of the 89 cases of this series, due to the advanced stage of the disease, to metastasis, to the finding of a cyst already ruptured or to the rupture of a cyst at operation. Ascites was present in 30 cases. Three patients of this group of 68 were alive and well four to ten years later. Their tumors were definitely of very low malignancy.

The prognosis in the remaining 21 cases was not frankly poor. Six had ascites. The contents of none of the cysts were spilled in the peritoneum. Only one is known to have died of recurrence. Eleven were well three to fourteen years later.

SUMMARY AND CONCLUSIONS

1. The percentage of sterility was 23.5; 23.5 per cent were single; 45.7 per cent had abnormal menstruation and 33.7 per cent had passed the menopause. This type of ovarian disease seems to be associated with lack of function, abnormal function, and with involution.

2. There is evidence that not all of these tumors are malignant from their inception.

3. Those patients who had bilateral tumors at operation or who developed a second one later comprise 50.5 per cent of the series.

4. The microscopic degree of malignancy was of some value in prognosis.

5. Taking the series as a whole, of those traceable, at the end of three years 33 per cent were alive and of those traceable at the end of five years 19.6 per cent were alive. Less than 10 of the series, i.e., about 10 per cent, may safely be considered cured.

6. Ascites was present in 40 per cent of patients, 3 of whom are now considered cured. Ascites in itself does not affect the prognosis.

7. There were 10 operative deaths, 11.3 per cent, five of which occurred before 1897.

8. Every effort should be made to avoid spilling cyst contents in the peritoneal cavity. If the tumor happens to be microscopically malignant, previous abdominal paracentesis or rupture at operation eliminates all chance of cure.

9. Since this type of tumor is so often bilateral, since the patients are sterile or beyond the childbearing age and since there is usually considerable associated pathology, the conservative procedure is hysterectomy. The diagnosis, gross and microscopic, should be made at the time of operation.

* * * *

OVARIAN FIBROMAS

Fibromas were found in 55 cases. It was incidental in 34 instances, operation being performed primarily for fibroids, prolapse, dysmenorrhea, sterility, retroversion, large ovarian cyst, carcinoma or appendicitis—and in these cases the tumors were too small (less than 6 centimeters) to cause the symptoms complained of.

Family History: tuberculosis in 3.6 per cent; malignant disease in 7.2 per cent.

Past History: one patient had had unilateral oophorectomy; one had had hysterectomy without removal of the ovaries.

Age at Operation: youngest, 20; oldest, 78. In 58 per cent the tumors occurred between the ages of thirty and fifty.

Marital Condition: 20 per cent were single; 12.6 per cent were sterile. The average number of pregnancies was 3.2, of children, 2.6.

Menstruation: 27.2 per cent had passed the menopause; between 40 and 50 per cent of the others had some abnormality.

Complaints:

Swelling of abdomen	11	"Falling of womb"	17
Backache	12	Sterility	3
Pain in lower abdomen	21	Flowing	5

In 60 per cent of cases the duration of symptoms was less than three years.

OPERATIONS AND RESULTS

Ovarian resections were performed on 13 patients. One is untraceable. Eleven were well one to twelve years later. Two had had two normal pregnancies and three abortions. One died of carcinoma of the pancreas twelve years later.

Unilateral oophorectomy was performed on 12 patients. There was one operative death. Four are untraceable. One patient died of intestinal obstruction five weeks later; one, of pernicious anemia three and a half years later; one, of pulmonary tuberculosis sixteen years later. Four were well one to eleven years after operation.

Supravaginal hysterectomy and bilateral oophorectomy were performed on 28 patients. There was 1 operative death from pulmonary embolus. Six are untraceable. One died of pneumonia seventeen years later; the other is well six years later.

PATHOLOGY

Grossly the tumors were of a yellowish white color, firm and irregular. Their surfaces were smooth and glistening or rough and papillary. More or less cystic degeneration was found in the larger fibromas; hyaline degeneration was common. The smallest fibroma was 3 millimeters in diameter; the largest, 25 centimeters. Fifty-six per cent of the tumors were 5 centimeters or less in diameter. They were bilateral in 7 cases, or 12.7 per cent. Microscopically they consisted of connective tissue which showed a wide range of density and cell content. In 16 cases there were adhesions involving the tumor. Three patients had ascites.

ASSOCIATED PATHOLOGY

Fibroids	18	Carcinoma of endometrium	1
Endometrial polyp or polyps (14.5 per cent)	8	Benign papillary cyst, other ovary	1
		Benign papillary cyst, same ovary	1
Gland hypertrophy of endometrium	5		
Pseudomucinous cyst of other ovary	3		
Bilateral papillary serous cysts and bilateral fibromas			1
Malignant papillary cyst and bilateral fibromas			1
Fibrosarcoma of one ovary and bilateral fibromas			1

SUMMARY AND CONCLUSIONS

1. Although none of the patients in this group who were submitted to conservative operation are known to have had further ovarian trouble, the frequency of menstrual abnormality and the associated pathology, both ovarian and uterine, indicate that the finding of a fibroma may be a danger signal pointing to possible serious disturbance.

2. The operative mortality was 3.6 per cent.

3. If there be no malignancy and no serious associated pathology, conservative operation is indicated for this type of tumor.

* * * *

OVARIAN SARCOMAS

Sarcoma was diagnosed in 14 cases. The family and past histories were negative. Half of the patients were over sixty years of age. Ten, 3 of whom complained of flowing, had passed the menopause. Of the remaining 4, 1, nineteen years old, had acquired dysmenorrhea; the second, thirty years old, had not menstruated for sixteen months; the third, thirty-nine years old, had not menstruated for a year; the fourth, aged forty-five, had menstruated irregularly for one year. In 12 cases the duration of symptoms, abdominal swelling and pain, was one year or less.

OPERATIONS AND RESULTS

In 1 case an advanced stage of the disease was found at exploratory laparotomy. The patient is untraceable.

Unilateral oophorectomy was performed on 4 patients. There was one operative death—from peritonitis. Two patients died of recurrence within one year; 1 was well six years later.

Supravaginal hysterectomy and bilateral oophorectomy were performed on 9 patients. Three died of recurrence less than one year later and 6 were well eight months to six years after operation.

PATHOLOGY

Just as leiomyosarcomas are most often found in fibroids that show cystic or hyaline degeneration or calcification, so the ovarian sarcomas are often associated with fibromas having these changes. In the present group of which two were round-celled and 12 spindle-celled or fibrosarcomas, 9 showed hyaline degeneration, 3 cystic degeneration and 2 calcification. In some of the fibrosarcomas were found areas similar to the round-celled type.

Grossly some of the tumors resembled fibromas; others were friable and spongy. The smallest sarcoma was 1 centimeter in greatest diameter, the largest, 25. Adhesions of the tumor to surrounding structures were present in 11 cases. Ascites was present in 7.

ASSOCIATED PATHOLOGY

Endometrial polyp or polyps	5 (35.6 per cent)
Multiple fibroids	3
Gland hypertrophy of the endometrium	1
Bilateral fibromas and sarcomas	1
Bilateral malignant papillary serous cysts	1
Pseudomucinous cystadenoma of same ovary	1
Pseudomucinous cystadenoma of other ovary	1

COMMENT

In 2 instances the sarcomas apparently had a profound prohibitive effect on menstruation. An endometrial polyp was present in 5 of the 8 cases in which uterine cavities were examined.

SUMMARY AND CONCLUSIONS

1. This paper consists of a clinical and pathologic analysis of the usual proliferative ovarian tumors treated at the Free Hospital for Women in a period of over fifty-two years.

2. With the exception of the dermoids the origin of the proliferative ovarian tumors seems to be associated with lack of ovarian function, abnormal ovarian function, and ovarian involution. The prolonged irritative effect of the contents of some benign cysts may be the stimulus to malignant change in certain instances. In other cases pressure or torsion results in a curtailed blood supply to an ovary or to a benign ovarian tumor. This is followed by hyalinization and calcification or necrosis. To survive, cells change their methods of metabolism and growth and a malignant tumor results.

3. No undiagnosed abdominal tumor should ever be tapped, for if it is malignant, tapping will reduce the possibility of cure to almost nothing.

4. Every effort should be made to remove ovarian tumors intact without spilling any of their contents in the peritoneal cavity. Immediately upon removal the tumor should be examined grossly and microscopically. If it is a dermoid, benign pseudomucinous cystadenoma or a fibroma, unilateral or bilateral, and there is no other pathologic condition, conservative operation is indicated. If it is a benign papillary serous cystadenoma and the other ovary appears normal, conservative operation, in the absence of other pathologic conditions, will depend on the patient's age and desire for pregnancy. If the other ovary is left, the patient should be watched for years. If the tumor is malignant, radical operation should not be deferred, even with a normal appearing opposite ovary. In every case the vagina, cervix, and uterine cavity should be routinely examined to rule out possible associated pathology.

5. Spontaneous regression of microscopically malignant ovarian tumor did not occur in any case of this series.

6. Postoperative irradiation in three malignant cases did not apparently affect the outcome.

7. The microscopic grade of malignancy is of some value in prognosis in a few cases.

I am grateful to Drs. William P. Graves and Frank A. Pemberton for the use of their private records and for their generous assistance.

THE ETIOLOGY OF ADENOMYOSITIS AND UTERINE FIBROMYOMA: AN HYPOTHESIS

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IN ANOTHER article I discussed the histogenesis of adenomyotic growths, and I now wish to touch upon the subject of their etiology. The latter is still more disputable than the histogenesis, and I would not have the temerity to tread upon this uncertain ground at all had not Sampson a short time ago advanced an etiology not only for endometriosis but for uterine fibromyomata as well.

Based upon his experiments published in 1918, showing that fluids forced into the uterine cavity may enter the venous sinuses of the wall, Sampson has stated that leiomyoma of the uterus may be due to local hyperplasia of the muscle cells in reaction to the stimulus of menstrual blood, which by a retrograde current has reached these particular areas. As proof of such an etiology in uterine fibromyomas, Sampson offers the observation that smooth muscle tissue in contact with heterotopic endometrial tissue often shows a tendency to grow. He believes that the cervix and tubes seldom produce fibromyomas because they do not menstruate, and that uterine fibromyomas are so much more common in the human female than in any other mammal because none of the latter menstruate. Aside from the fact that, as mentioned in the previous paper, there are justified doubts regarding the growth-producing properties of the menstrual blood, and the additional point that the apes menstruate, but rarely have uterine fibromyomata, there are other grave objections to this "menstrual blood" theory of Sampson. At the same time there can be no doubt either theoretically or logically that the etiology of endometrial growth wherever situated and uterine fibromyomas, must be closely connected, since these structures are all definitely müllerian tissue.

To arrive at a rational etiology of any condition, one must start with and carefully weigh those facts which are really known. In the case of adenomyositis, these are soon stated:

1. Adenomyositis occurs only in the female. (The case of adenomyositis in the urachus of a man fifty-five years old, reported by Koslowsky, I regard not as an adenomyositis, but simply as an allantoic rest.)

2. Adenomyositis occurs only during the sexual life of the woman.

3. Adenomyositis regresses after castration or atrophy of the ovaries. There appear in the literature certain case reports (see Graves) which seem to contradict this last statement. Katz and Szenes, for instance, report that they were able to grow endometrium in both normal and castrated animals. Probably this can be explained, just as the continuance of menorrhagia following bilateral castration, as being due to the aberrant remnants of ovarian tissue. Persistence of chocolate cysts following x-ray and radium castration with atrophy of the uterine endometrium and uterine fibromyomata is also recorded. This is no proof against the truth of our third conclusion, since there is no evidence to show that these chocolate cysts are really still active. Such cysts filled with old blood would naturally take a long time to disappear; furthermore after x-ray or radium treatments, continued amenorrhea with a subsequent pregnancy is not unknown.

From the facts presented one truth stands out, namely that in some way or other the ovary is responsible for adenomyositis. Can we then find a concept which will offer a reasonable etiology for these growths? I believe I can venture an hypothesis which will at least theoretically explain not only the occurrence of adenomyositic lesions, but also their vagaries and perhaps also be applicable to the uterine fibromyomas.

Before taking up adenomyositis, let us review the reaction of the endometrium itself to ovarian influence. Before puberty there is no real endometrium, and after the action of the ovaries is lost, the endometrium atrophies. It can now be definitely stated that the monthly proliferative changes in the endometrium are based on follicular activity, and that the secretory or premenstrual changes are due to corpus luteum activity. That the substance producing, for instance, the decidual reaction in the premenstrual endometrium is carried by the blood stream was shown even before Allen and Doisy, before Frank and his collaborators and others demonstrated a female sex hormone in the blood, by the fact that it is around the small blood vessels in the form of a thinner or thicker mantle that the stroma cells of the uterine mucosa first acquire their decidual characteristics. This is an important point.

If, then, the ovarian hormone carried by the blood stream causes the endometrial changes, it is justifiable to assume, and this is supported by clinical and pathologic evidence, that the amount of hormone will, other things being equal, determine the amount of reaction shown by the endometrium. Increased follicular activity would lead to increased growth of the endometrium. Thus in the hyperplasia of the endometrium I have seen follicular cysts of the ovary associated in most cases. In fact, from the histologic picture alone of a slide showing a definite hyperplasia of the endometrium, I have felt so certain

that the ovaries would show small cystic degeneration that I have often advised examination of the patient and careful palpation of the ovaries, even under anesthesia, if necessary, and resection of the cystic organs, should they be present, which indeed they often were. Schroeder, for example, states that in many of his cases of hyperplasia of the endometrium, corpora lutea were lacking or subnormal, menorrhagia was not present, and even menstruation was decreased or absent. In such cases, of course, there would be a cumulative action of the follicular substance without the respite caused by menstruation, and therefore continued proliferation would take place. At the same time certain authors (Novak and others) found corpora lutea in the ovaries in most cases of endometrial hyperplasia. This also has been my usual experience. Whether or not we find corpora lutea does not make any difference in the underlying etiology, since the endometrium, even if lost at menstruation, can grow very fast, especially under the impulse of excessive follicular activity. I have seen a thin, dense endometrium completely covered by regenerated epithelium as early as the day after the cessation of menstruation.

In some cases of endometrial hyperplasia, menorrhagia occurs, whereas this is absent in others. This also is not a contradiction. I believe here that it depends on the amount of corpus luteum hormone carried by the blood supply to the particular part. Thus, as mentioned in a previous paper, the follicular action, because it may be continued for months and thus be cumulative, may be sufficient to cause endometrial hyperplasia while the corpus luteum action in the nature of things cannot be thus cumulative. It may be insufficient to cause the endometrial changes necessary as a preliminary to menstruation, so that externally at least no sign of corpus luteum activity will become evident.

Hammond has shown that in the ferret, which ovulates only on coitus, the same endometrial picture, the result of follicular activity, is carried through estrus, if coitus, and thus the formation of a corpus luteum, is prevented. That menorrhagia also occurs without hyperplasia of the endometrium is no contradiction since other not directly related causes may of course lead to uterine bleeding.

The small cystic degeneration of the ovaries used to be interpreted as due to inflammation, but this is certainly not so. It is due to congestion, and the increased blood supply causes an increased number of follicles to ripen, and this in turn causes the endometrial changes. The fact that endometrial hyperplasia is more frequent around the fortieth year of life, I believe we can explain by the fact that around that time many women are heavier, less active, and have perhaps a lessened muscular tonus, all of which causes would lead to pelvic congestion. In addition, I want to stress particularly constipation as a source of such congestion.

However, we have cases of endometrial hyperplasia where no evidence of ovarian hyperactivity and no small cystic degeneration of the gonads is present. I still believe we are dealing here with exactly the same process as before. More ovarian hormone may reach a particular area, first, because more of this substance is present in the blood stream, and second, because congestion and slowing of the blood current allows more hormone to seep out by a process of osmosis in one particular spot. Thus congestion would lead to hyperplasia, and uterine congestion is indeed often associated with endometrial hyperplasia. In some endometria, however, on one and the same slide different areas are seen which show different pictures of the menstrual cycle. Localized congestion or congenitally or otherwise abnormally situated or developed blood vessels and capillaries will explain just such an occurrence.

Since fibromyomas of the uterus grow only in the presence of the ovaries, and atrophy when these are lost, it seems perhaps not altogether unreasonable to interpret such tumors as being perhaps due to increased ovarian activity coupled to local areas of congestion, due to congenital or acquired formal defects or simply to stasis. If, on the other hand, there is diffuse congestion, it might cause the condition known as metropathia chronica. To me such an explanation seems more reasonable than Sampson's idea of irritation by retrograded menstrual blood. That the human female shows fibromyomata more frequently than other animals I would explain not by the fact that other mammals do not menstruate, but rather as being due to continued ovarian activity present in the human female—an ovarian activity by far the greatest and most consistent in the whole animal kingdom. The reason why there are so few fibromyomata of the tube and cervix is because these structures are normally incapable of reacting much to the ovarian hormone. Indeed, in accepting the theory of localized congestion and overactivity of the ovarian hormone, we may even assign a reason why the American negro is so frequently afflicted with fibromyomata uteri, while the aboriginal African black is not so afflicted. Anyone familiar with the strict rules of sexual abstinence of the aboriginal African blacks will certainly admit that these tribes are in comparison with the civilized American or European distinctly undersexed. There are also other reasons for thinking so, which I cannot take up here. I need only refer to the breast changes. Alfred Adler has called particular attention to the fact that organs below par are especially the ones which can and will react to a stimulus by an excessive reaction, and such excessive reaction may well, probably because of environment, food and living conditions, be accepted in the case of the American negro.

If we now turn to adenomyositis, we see that after the wolffian theory had been dropped more or less, and the serosal theory gained prominence, a why and wherefore of the lesions was sought. Robert Meyer thought he had found it in an inflammation of the area developing adenomyositic growths. It was thought that the inflammation produced loosening of the stroma and thus postfetal growth (Opitz, Pforte, Raspini, Schütze, Sitzenfrey, Vautrin, and others). Many cases indeed showed inflammation at the site of the adenomyositis and there can be no doubt that inflammation or irritation is a stimulus to growth; some of the pictures, especially Figs. 5 and 6 of my previous paper, illustrate this. It is also interesting in this connection that Spence (Gynecological Transaction 50: 248, 1925) states that he never sees adenomyositis in laparotomy wounds, and thinks perhaps this is due to the fact that he carefully buries his sutures, whereas many American surgeons leave the suture ends fairly long, thus creating a source of irritation of the peritoneum. Although inflammation and irritation could be shown to be present in many adenomyositic lesions, other cases showed none at all, so that the name of adenomyosis was suggested by Frankl for the latter type of lesion. In every case of adenomyositis that I have observed there is, however, either clinically or histologically, an evident congestion present. I believe that this fact and not an inflammation per se is the crux of the matter. Lahm has seen cytogenic-like stroma develop in areas which showed convolutions and dilatation of the subserosal connective tissue of the uterus, either on the basis of congestion or due to certain formal defects in the tissue structure at this point, thus causing a relaxation of the blood vessels. Thus we may see adenomyositis at points where, for one reason or another, increased ovarian activity was applied, either because of increased follicular activity or because of localized congestion or, and most probably, because of both factors.

It might, of course, then be asked why we do not see adenomyositis in the acute inflammations of the pelvic organs or in chronic pyosalpinges, and why we do see invasion of the uterus by the endometrium, especially in older women. These objections I think are not serious. Acute inflammations often do not make their action felt for a sufficient length of time, and furthermore, all severe inflammations upset the whole organism so much and disturb the blood supply and lymphatics to such an extent, that locally applied ovarian activity does not occur. Indeed, in many of the severe inflammations the ovarian activity, together with the whole organic mechanism of the patient's body is depressed and not stimulated. That inflammation, however, often is the initial stimulus to heterotopic epithelial growth is shown by the frequency with which adhesions are found in such cases, and I believe that often such adhesions are primary and linked with the development of heterotopic endometrial growth, and are not secondary to it.

As far as invasion of the uterine wall by the endometrium, especially late in life, is concerned, we have, I believe, the same factors here at work that have been discussed under endometrial hyperplasia. Aside from this we may assume that the irregular corpus luteum production also has its effect, and that uterine muscle changes in addition may lead to changes in the tissue balance and allow of penetration of the endometrium. This to me is more logical than to assume, as has been done, that the basalis, in the course of the many years of its regeneration of endometrium, has acquired an activity which causes it to invade the uterine muscle because it no longer forms endometrium. The basalis, according to my observations, shares in the final atrophy upon loss of the ovarian activity, just as much as the rest of the uterine lining, and deficient ovarian function does not cause hyperplasia of the endometrium. I therefore consider Lauche's idea that the cause of adenomyositis lies in deficient ovarian function which gives rise to compensatory endometrial growth, as untenable. It could apply only if the endometrium had an hormonal activity similar to the ovary, and this has not been proved. In view of the dependence of endometrial growth on the ovary, and the loss of tissue each month from the uterine lining, I think this idea can be definitely considered to be illogical. Courrier, because he found that injections of ovarian extract into newborn animals caused proliferation of vaginal epithelium, holds views similar to Lauche. Ovarian extract, however, causes not only vaginal but also the rest of the müllerian epithelium to grow. That Robert Meyer saw a "verschleimung" of the vaginal epithelium in bitches during pregnancy, also does not support Lauche's theory, since we are dealing here not so much with a deficient ovarian activity as with increased corpus luteum activity.

There is only one last point to consider, namely, the question as to why the lower parts of the pelvis and the ovaries are especially often the seat of adenomyositis. If congestion plays any rôle, naturally the lowest parts of the celom would be most frequently affected. The ovary is very prone to congestion and often prolapses. Adhesions also occur frequently. Again the blood and lymph vessels (and according to Bruhns there are only six or eight lymph vessels in the ovary) enter the hilus and then become very convoluted, thus further leading to congestion. In addition, it is probably true that nearer to the source the blood stream contains more ovarian hormone than further away.

In conclusion, I wish only to say that while the theory offered is necessarily purely hypothetical, certain clinical and pathologic evidence seems to support it. I believe it to be at any rate more logical than the "menstrual blood" conception of Sampson, for which reason I offer it here for what it may be worth.

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30 EAST FIFTY-EIGHTH STREET.

D'Aprile, F.: Diabetes, Pregnancy and Insulin. La Clinica Ostetricia. **29**: 353, 1927.

Only a few diabetics become pregnant. This sterility is thought to be relative only, being due to endometritis, imperfect ovulation and poor physical condition. If the diabetes is present before the onset of pregnancy it will be very much aggravated by the pregnancy. Its onset is very insidious and slow and results in a very grave condition toward the end of the pregnancy. In many cases a spontaneous abortion occurs and more frequently a premature labor.

Another common complication of pregnancy and diabetes is polyhydramnion. This is found in 20 per cent of the cases and is especially manifest in the grave cases. The total amount of amniotic fluid may be as high as twelve liters. The babies which are born prematurely often appear quite similar to the hereditary syphilitic babies. Weights as high as 7000 gm. have been reported.

There is always grave danger in allowing a diabetic to go through labor because of the lacerations and infections which may occur, since the diabetic is particularly prone to infections.

In patients who have had a definite diabetes mellitus and who have been treated with insulin during pregnancy, the babies have very often been stillborn. The insulin therapy may help the mother but has little effect upon the fetus.

J. M. PIERCE.

GONORRHEA IN THE FEMALE*

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Vanderbilt University)*

IT GIVES me great pleasure to lay before this learned society my results in the treatment of gonorrhea in the female. I have no apologies to offer for this commonplace subject as it is the most outstanding, unsolved problem that confronts our specialty today. My conclusions have been drawn from the first 100 patients treated in the Vanderbilt University Hospital according to the method that I will outline.

The cases reported in this paper all had positive smears. No case, however typical clinically, has been included if positive smears were not obtained. The series is somewhat unique in this respect and the good results are in my opinion, due to the fact that occasional cases of streptococcal or tubercular pelvic infection have been excluded.

The diagnosis of gonorrhea from smears at best is a laborious procedure, as only a third to one-half of those infected will show positive smears unless repeatedly examined. Diagnosis by means of culture has been tried, but results have been unsatisfactory. I am inclined to believe this is the ideal method, but for practical purposes it is yet an uncertain procedure.

The complement-fixation method has not been used on account of practical and physical conditions existing in the hospital. Repeated negative smears following the menstrual periods in absence of symptoms have been the criteria of cure.

There are three sites of infection in the female: the urethra, Bartholin's glands, and the cervix. It is not unusual to find all three sites involved. The one that is more likely to escape is Bartholin's glands, and the one that rarely, if ever escapes is the cervix. When the gonococcus obtains a foothold in the cervix it remains almost indefinitely, reinfecting the other two sites and what is still more disastrous traveling through the uterus over the endometrium to the tubes producing a salpingo-oophoritis and pelvic peritonitis with all of its disabling sequelae.

The vagina is only involved in children and young girls. The endometrium does not offer a fertile soil for the gonococcus except in puerperal cases. Gonococci are only found in the lower urethra. They do not ascend to the bladder, a neisserian infection of this organ being almost a medical curiosity. The infection in the urethra may be pri-

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mary or it may be secondarily involved from secretions from the cervix. The urethra offers a good resistance against gonococci and in due time will overcome them, unless reinfection takes place from the cervix or unless it is continually irritated by active treatment. Urethral symptoms as a rule are mild. In many cases they are barely noticed by the patient. In a few females with sensitive urethrae the symptoms may be quite prominent but even here they quickly subside unless badly managed.

Skene's ducts which are situated on the floor of the urethra and just inside the meatus are involved in only a small percentage of cases. They do not put up a good fight against the invaders and when infected they are likely to remain so for a long time.

Urethritis is best managed by a let-alone policy. Eradicate the other foci and nature will clear up the urethra. I desire to strongly condemn injection, irrigation, and topical applications. Hot sitz baths, urinary antiseptics and sedatives will make the patient more comfortable and assist nature in its natural resistance.

Skenitis on the other hand should be vigorously treated. It should be suspected in all cases of urethritis that do not clear up in a few weeks. The ducts are easily found if the meatus urinarius is dilated and a proper skenescope used. Occasionally the ducts can be seen without dilatation or the use of an instrument. Skenitis if looked for and recognized is easily eliminated. A cure is effected by laying open the ducts with a small cautery. Another easy and equally effective method is the injection of the ducts with tincture of iodine through a probe pointed needle.

Infection of Bartholin's glands is usually unilateral. It may be the first symptom that calls the attention of the patient to her infection and if not eradicated is likely to produce recurrent attacks. The most certain method of eradication is excision of the glands. This, however, is not always possible on account of abscess formation and rupture at the time the case comes under observation. Under these circumstances the abscess should be opened if this has not already occurred spontaneously, the cavity everted, fulgurated and packed with gauze and made to heal from the bottom.

The cervix offers a problem which is well worthy of our deepest consideration. This is the favorite breeding ground of the gonococcus. From this site the infection may go up or down. If it goes up it will produce an infection of the appendages. If it goes down it will produce a reinfection of the urethra or Bartholin's glands. As long as the infection persists in the cervix, so long is it a menace to the woman's future health and happiness and so long is she a distributor of gonorrhea, should sexual relations take place.

The symptoms of cervicitis are mild unless associated with salpingitis, and under such circumstances the cervix is likely to be overlooked

by the attending physician. The only symptom of cervicitis is an increased leucorrheal discharge. This may be associated with a feeling of fullness in the pelvis and a low backache, due to uterosacral pathology. These symptoms are common in females and likely to be overlooked. I use the following surgical procedure for the relief of gonorrheal cervicitis:

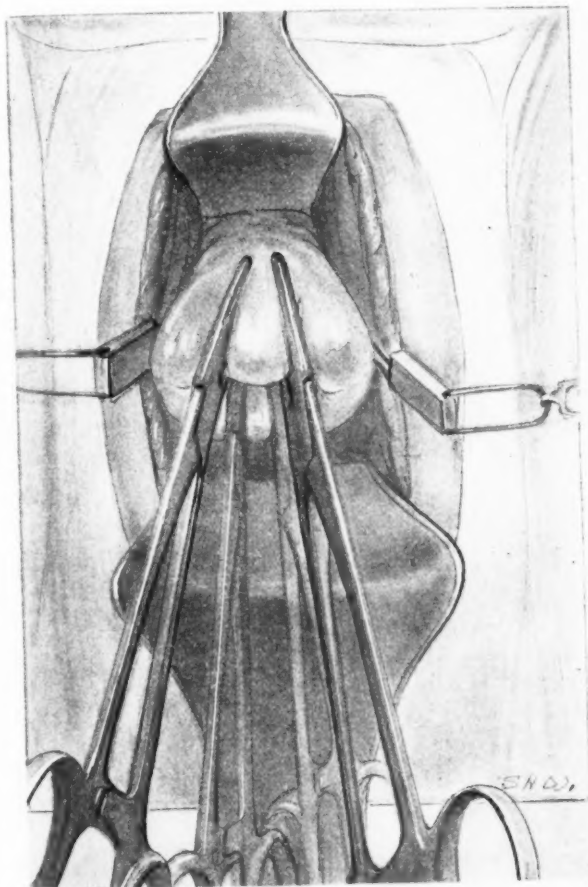


Fig. 1.—Cervix brought to vaginal outlet and forceps placed on each side of median line on anterior and posterior lips for purpose of hemostasis.

It should not be carried out at the height of an acute pelvic inflammation for fear of spreading the infection. It is also difficult at this time to expose and bring down the cervix while it is firmly fixed to the surrounding tissue. One can use satisfactorily sacral, general or spinocaine anesthesia. The cervix is exposed and steadied by volsella, and a hook as shown in the illustration is placed in each lateral lip. Any standard needle holder may be used to insert the hook. After insertion the needle holder is removed and traction is made by the chain. These hooks will not produce bleeding at the site of insertion nor will they pull out, and the view of the deeper parts is not obstructed by handles. The cervix is then dilated with Hegar's dilators (not Hank's), the dilatation being carried to at least size 12 and

occasionally to size 20. It is essential that the folds of the mucous membrane be flattened out by the dilatation in order to make the subsequent cauterization effective. Two artery forceps with blades sufficiently long and with not too strong a bite are placed on each side of the median line of the anterior and posterior lips for the purpose of complete hemostasis. The cervix is then opened up in the median line of the anterior and posterior lips to the internal os. The forceps on one-half of the cervix are spread in opposite directions and this brings in view one-

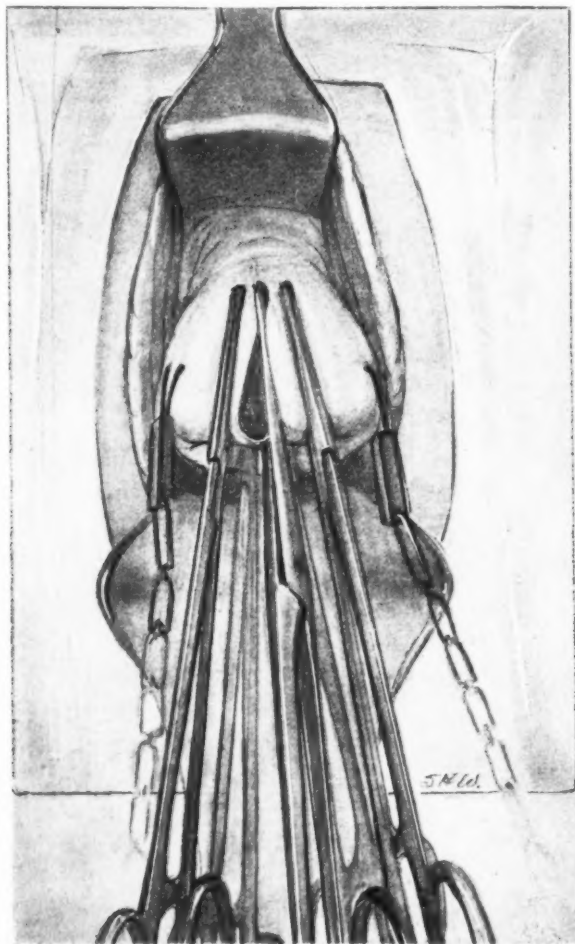


Fig. 2.—Incision of anterior lip of cervix to internal os with scissors.

half of the endocervix. The exposed area is then thoroughly cauterized and the same step carried out on the opposite side. The forceps are now removed and the area of mucous membrane that was in the bite of the forceps is cauterized. It is important that the cauterization be carried well up to the internal os. It is at this point that gonococci are quite difficult to eradicate and this explains why a Sturmdorff's operation often fails to cure a gonorrheal cervicitis. The incisions in the anterior and posterior lips are then closed with interrupted catgut sutures. The cervical canal is lightly packed with gauze. This gauze is removed at the end of

forty-eight hours and the parts are kept clean by sitz baths and pitcher douches. Unless there is some contraindication such as large pelvic masses, the patient is allowed to leave the hospital at the end of four or seven days, returning every week for smears for at least two months. Complete abstinence from alcohol and sexual relations must be practiced during this period. The most reliable smears will be those taken immediately following a monthly period. If the operation is properly performed the cervix will be cleared of gonococci and will remain so unless intercourse takes place with a partner harboring this infection.

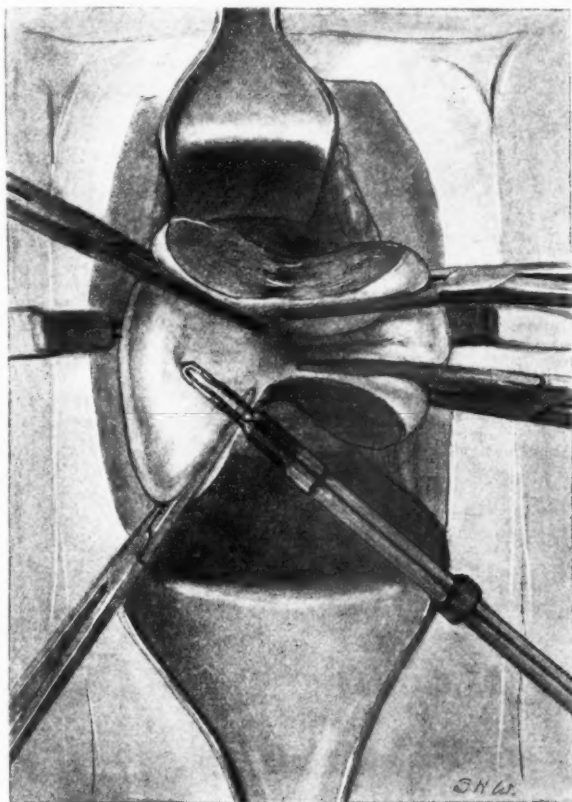


Fig. 3.—Cauterization of one side of endocervix. It is exposed by pulling hemostatic forceps on that side in opposite directions. I have used in a few cases the electrical coagulator with gratifying results. Time and experience may show that the coagulator is preferable to cautery.

Four of the patients in this series have been delivered. Two of the 4 had normal labor. One had labor induced at the eighth month on account of toxemia, the fourth had a shoulder presentation associated with a Bandl's ring and the delivery of a dead child. Two others to my knowledge are now in the early months of pregnancy. Five had slight hemorrhages ranging from seven to fourteen days after the operation on cervix. None of these hemorrhages have been alarming and not as severe as I have seen after linear cauterization. I have been

unable to find a single case that developed a stricture of the cervical canal.

For the relief of the epidemic form of vulvovaginitis in children I advise ointments, topical applications and vaccines. I want to strongly condemn the use of douches and injections on account of what happened to one patient on the service of Dr. Horton Casparis, Head of Department of Pediatrics, Vanderbilt University Hospital. An eight-year-old child was admitted with a gonorrheal vulvovaginitis. The

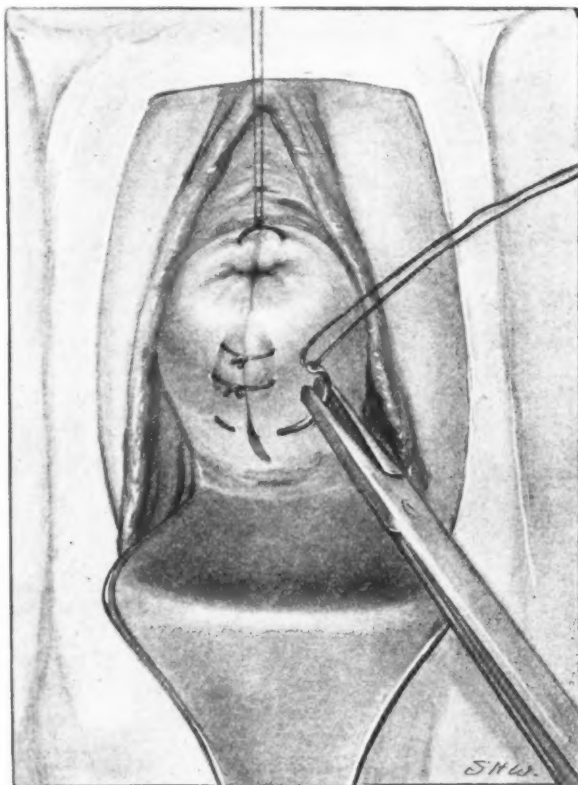


Fig. 4.—Closure of incisions in cervix with interrupted sutures.

treatment was instillation of mercurochrome in the vagina. She developed a general peritonitis and died. Postmortem showed mercurochrome all over the peritoneal cavity.

Many patients are unaware of their trouble until the disease reaches the tubes, ovaries, and pelvic peritoneum. The well-known symptoms of pelvic inflammation appear. Fortunately these tissues soon overcome the infection and the patient then believes she is well until another attack takes place. This will often happen unless the focus of infection is eliminated in the cervix.

I have been impressed many times in the past by the almost miraculous way in which nature handled pelvic inflammation. I have had several cases showing large masses in the pelvis in which I operated years afterward for other conditions and found the pelvic organs practically normal. Patients for whom operation had been advised and refused, later conceived through the same tubes that I had wanted to remove. These experiences lead me to the conclusion that nature assisted by rest, protein therapy, and other forms of palliative treatment would cause the pelvic inflammation to subside and if the focus of infection in the cervix was eliminated the patient would recover and remain well in the great majority of cases.

Palliative treatment for this condition is nothing new. It has a few advocates in this country and has been extensively used in Germany. The weak link in the chain in palliative treatment in the past has been the nonelimination of the focus of infection. It is now the custom in most American hospitals to treat all patients in a palliative way until acute symptoms subside and then to open the abdomen and remove all or a great part of the internal organs of generation. The net results of such surgery are that these young women lose their ovaries but are left with a cervical gonorrhea.

Of the 100 patients in this series not one has had an abdominal section and many of them had large masses that were the accumulation of several attacks of pelvic inflammation. Abdominal section has not been performed on a single patient with pelvic infection of gonorrheal origin in the Vanderbilt Hospital since it was opened in September, 1925.

It is hardly necessary to state that if a pelvic abscess forms it should be drained. Abdominal section is only indicated in those patients who have disabling masses in the pelvis which prevent them from following their ordinary routine of life, repeated negative smears and a sedimentation time of one hundred minutes or more. I consider the sedimentation test a most reliable one. It is not only a good index as to the progress of the infection but also is a reliable guide as to a safe time for abdominal section.

The total number of patients receiving milk injections was 66. The total number of milk injections was 301 and the average number of injections per patient was 4.56 plus. I strongly endorse the suggestion made by Polak of producing temporary amenorrhea with x-ray in this class of patients. This prevents the monthly congestion of the generative organs and gives nature a better opportunity to clear up inflammatory exudates. Some patients naturally have a soreness and tenderness in the parts for some time, but all of this will pass off in the great majority of cases if the focus of infection in the cervix has been eliminated.

Living in a city where the medical profession is on most friendly terms I have been able to follow those patients who later entered other hospitals. Five women who received this treatment in the Vanderbilt Hospital again contracted gonorrhea through illicit intercourse or mar-

riage. These patients were sectioned in other hospitals and a part or the whole of their internal organs of generation were removed. In 3 of the patients I was able to obtain the specimen removed at operation and in 2 others a report on conditions found in the pelvis was obtained from the operating surgeons. In none were large masses removed and I am firmly convinced that they could have been saved if foci of infection had been eliminated. I also have the report on 3 patients who had large pelvic masses at the time the cervix was operated upon and who were subsequently operated upon for appendicitis. In these 3 patients the operating surgeons reported that the pelvic organs were normal or almost so. For the woman who is mentally and morally deficient and who will immediately take chances on reinfection, I can offer no solution for the problem. For the woman who wants to get well and remain so I can recommend the treatment outlined. It will cure the gonorrhea and will make abdominal section unnecessary in over 90 per cent of cases.

(For discussion, see page 732.)

AMENORRHEA DURING SERIAL ROENTGEN EXPOSURES DUE TO INTERVENING PREGNANCY

BY LEOPOLD GOLDSTEIN, M.D., AND DOUGLAS P. MURPHY, M.D.,
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NORMAL menstruation and pathologic uterine hemorrhage may be diminished or suppressed by pelvic roentgen therapy. A subsequent amenorrhea is usually attributed to the irradiation, though this may not be the cause. For instance, conception may have taken place just prior to treatment, which may not be suspected at the time of roentgen exposures. In addition, it is quite possible that the amenorrhea, occurring after one or more of the roentgen treatments, may be due to an intervening pregnancy. An assumption that the amenorrhea is due to the irradiation may allow the gestation to proceed unrecognized, as long as abortion does not occur. If conception takes place during or immediately before a series of roentgen exposures, the result may be a very early exposure of the embryo, which may thus receive a large amount of irradiation.

In a recent study of the health of children born after maternal pelvic radiotherapy,^{7, 8} it was concluded that postconception irradiation seriously interferes with fetal development. Mental retardation, manifested by microcephalic idiocy, was frequently observed in the children irradiated in utero, 24 per cent of the cases, to be exact.

As the basis of this paper we have used the reports secured from the current literature, upon 12 women who became pregnant in the interval between roentgen treatments. Brief extracts of these reports are recorded in the table. It will be observed that several women received a large number of roentgen exposures during pregnancy. Three of them gave birth to microcephalic idiots, whereas eight of them bore healthy children.

This report emphasizes the fact that conception, occurring before or during a series of roentgen exposures, may remain unsuspected throughout the entire course of treatment. Pelvic irradiation during pregnancy is prone to be extremely detrimental to the embryo. It is, therefore, exceedingly important to know the physiologic state of the uterus before pelvic roentgen treatment is instituted.

TABLE I. PREGNANCIES BEGINNING DURING INTERTREATMENT PERIODS

AUTHOR	TIME OF CONCEPTION	CONDITION OF CHILD
Apert, E., and Kermorgant	Coincident with amenorrhea after the first of 17 treatments	Microcephaly
Edelberg, H.	During the third month of treatment	Normal
Eymer, H.	Between treatments	Normal
Falkenheim, H.	Between the first and second treatments	Microcephaly
Foveau de Courmelles, V.	Between treatments	Stillborn
Ménard, M.	Between two of the eight treatments	Normal
Ménard, M.	Between the seventh and eighth of a series of 18 treatments	Normal
Ménard, M.	Between the 29th and 30th of a series of 35 treatments	Normal
Naujoks, H.	Between the first and second treatments	Microcephaly
Rénon, L., and Degrais	Between treatments	Normal
Schmitt, W.	Between treatments	Normal
Werner, P.	Between treatments	Normal

Norris¹¹ is a firm advocate of curettage preliminary to the employment of any pelvic radiotherapy. This procedure eliminates the possibility of unwittingly irradiating an embryo and, by histologic examination of the curettings, the condition of the endometrium is determined with certainty. In older women, among whom pathologic hemorrhages are common, the diagnostic curettage prevents the possibility of overlooking a carcinoma of the fundus, which is especially likely to escape notice if a myoma is present. In 75 per cent of the unsuspected fundal carcinomas occurring in the John G. Clark Gynecologic Clinic at the University of Pennsylvania, the symptoms of the malignant neoplasms were masked by preexisting myomas.

If a series of roentgen exposures involving the lower abdomen or pelvis is contemplated, the patient should not be permitted to become pregnant while the treatments are given. For several months after

the completion of the exposures, the patient should be watched for evidence of a conception having taken place in the interval between any two of the last several treatments. If pregnancy is found, abortion should be induced at the earliest possible moment, so as to prevent the birth of a defective child.

CONCLUSIONS

1. The amenorrhea concurrent with a series of therapeutic roentgen exposures may be due to pregnancy.
2. Conception may take place immediately before the first of a series of roentgen exposures, or may occur in the interval between any two of them.
3. An embryo may be damaged by maternal pelvic irradiation and consequently develop into a mentally defective child.

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Kleinberg: Maternal Obstetrical Sciatic Paralysis. Surg. Gynec. Obst. 45: 61, 1927.

Maternal obstetric sciatic paralysis occurs only rarely. It usually follows a severe labor in which decided difference between the size and shape of the pelvis and that of the fetal head is encountered, and in which more or less extensive instrumentation has been employed. The paralysis is apparently due to an increase in the intrapelvic pressure causing trauma to the sciatic nerves. The symptoms usually appear immediately after delivery, but are at times delayed several days. They are bilateral and include motor and sensory changes. Drop foot resulting from involvement of the external perineal nerve is a conspicuous sign. It may disappear partially or completely, but at times remains permanently. The treatment is entirely symptomatic, and the prognosis must be guarded, for we have no means of discerning the degree of trauma to the sciatic nerves, nor do we know any curative measure.

WILLIAM C. HENSKE.

Society Transactions

THE AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-FOURTH ANNUAL MEETING

OLD POINT COMFORT, VA.

May 20, 21 and 22, 1929

The papers presented at this meeting were as follows. For lack of space, the discussions necessarily must be presented in abstract.

Acute Puerperal Inversion of the Uterus, by DR. PALMER FINDLEY, Omaha, Nebraska. (For original article, see October issue, page 587.)

DISCUSSION

DR. B. P. WATSON, NEW YORK, N. Y.—This is a rare condition and none of us can have any large personal experience with acute cases. There is not a single case in the Sloane Hospital for Women records between 1921 and 1929, during which time over 13,000 patients have been delivered. I, personally, have seen only one case of acute inversion and operated on three cases of chronic inversion. None of them had been recognized at the time of labor. One case was rather remarkable.

The patient had a normal labor, but there was some slight delay in the expulsion of the placenta. A slight dimpling in the uterine fundus after expulsion of the placenta was noticed, but the fundus was palpable through the abdomen. The patient began to run a temperature immediately, and by the third day she was acutely ill with a temperature of 105°. Cultures from the vagina and from the blood were positive for hemolytic streptococcus. The course was very stormy for the next ten days when temperature was falling, blood culture had become negative and she looked better. Vaginal examination was then made and the inverted fundus felt in the vagina. It was obviously unwise to do anything at that stage. Three months later I operated by the abdominal route. The ring was incised posteriorly and the uterus reinverted. The peritoneal surface of the reinverted uterus was found covered with shaggy adhesions and I deemed it wise to do a supravaginal hysterectomy.

One of the other cases had a somewhat similar history. She was delivered in one of the city hospitals in Edinburgh, and had run a septic temperature in the puerperium. Patient was examined at the end of three weeks when inversion was discovered. In this case also, after an interval I reinverted by the abdominal route. The pelvis in this case was quite free from adhesions, and we left her with a functioning uterus.

In cases of acute inversion treatment of shock before attempting reposition is most important. An acute inversion is in the nature of an acute abdominal lesion, and the shock may be profound.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—At the Methodist Episcopal Hospital we had four cases of acute inversion in about 17,000 deliveries. Strange to say these four cases happened in two consecutive years, viz. 1925 and 1926. I think there are two reasons for this: first, we had a house officer who persisted in manipulating the fundus and otherwise interfering with the normal

mechanism of the third stage of labor; and second, we were using an ampule of pituitrin before the placenta was delivered with an ampule of gynergin or aseptic ergot after its delivery.

According to G. H. Davis, we have to recognize two kinds of acute inversion: acute spontaneous and acute delayed. The acute spontaneous inversion one naturally treats with reposition. In two of our cases we did this under surgical anesthesia, packing the uterine cavity with 4 per cent mercurochrome gauze. Both patients did well and went home at the usual time.

The other two cases fall under the classification of spontaneous delayed inversion. They were not recognized for ten days in one instance and twelve days in the other. We believe that in these two cases the inversion was gradually taking place during the ten and twelve days and was caused by a flabby and atonic uterus and overdoses of oxytocic drugs, e.g., pituitrin, ergot, etc. One case had three ampules of pituitrin and one of aseptic ergot after the placenta was delivered. These two cases died of shock and hemorrhage without reposition shortly after the accident. We do not (as Dr. Findley advised) attempt reposition until the patient recovers completely from shock.

The advice to do an immediate abdominal section and reduce the inversion from above seems to us too radical a procedure. An inversion which can be reduced from above, it seems to me, can be reduced as well from below. Deep surgical anesthesia, gentle manipulation and plenty of time are important prerequisites. Abdominal section on an already "shocked" patient is hazardous.

DR. G. BROWN MILLER, WASHINGTON, D. C.—I have to acknowledge three cases of uterine inversion in my private practice. One occurred without any manipulation of the fundus or pulling on the cord in a multiparous woman with a relaxed vaginal outlet. A few minutes after the child was expelled she had a tremendous pain and the placenta attached to the completely inverted uterus shot out of the vagina.

The other two cases were due no doubt to too vigorous manipulation of the uterine fundus where the woman was having considerable bleeding.

There was no very excessive hemorrhage in any of the three cases. There was no shock that could not be accounted for by the bleeding. In every case the treatment was the same. We used gauze to separate the placenta, irrigated with normal salt solution, and then adopted a method which I believe is of great value. The trouble in reinversion of the uterus is that attempts to reinvert it may fail because there is nothing to push against, as it were. In every case we gave the patient anesthesia, pushed the whole mass as far upward as possible until the vagina was put upon a stretch, and during a relaxation of the uterus the manipulation of reinverting it in the exactly opposite way from which it became inverted was followed, and we had no difficulty. In no case was there rise in temperature above 100° or subsequent infection of any kind. After I was assured the uterus had been reinverted, the patient was given some pituitrin and was watched for several hours. Packing was not done in any case and in none of the three cases was there any subsequent inversion.

With good technic I believe there is no more danger to the woman with a complete inversion *promptly recognized and properly managed* than in detaching an adherent placenta by means of the hand in the uterus.

DR. JOSEPH P. DELEE, CHICAGO, ILL.—I would like to ask the chair to have each gentleman give the number of cases of inversion that have come under his notice that have not been published. That would give us a cross-section of the experience of the country as a whole. In something over 65,000 labors in the Chicago Lying-in Hospital there is only one case of total inversion of the uterus reported.

During the last five years we have given pituitrin routinely after the baby is born and have had only this one inversion, so I doubt if the pituitrin can be incriminated. In two of my cases the uterus began to turn inside out as I was watching the third stage. I reinverted the fundus of the uterus very quickly and packed. Had I been less watchful these cases would undoubtedly have had to be recorded as complete inversions.

I did a cesarean section on a woman who had an inverted uterus in a previous labor where Spinelli's operation had been performed. She had had a stormy recovery but lived to have her second child. At the subsequent cesarean I found a very thin scar.

The case mentioned first was attended by an intern who was very nonchalant; when the uterus turned inside out, he simply pushed it back again as though nothing had happened, and the woman made a complete recovery.

Since then a patient died in her home before she could be brought to our hospital.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—Statistics are absolutely unreliable because there is no question that the incidence of inversion is much greater than appears from recorded instances. In 17,000 cases that we have had in our service there has not been a single case of inversion and yet in my personal experience I have seen six cases, none of which has been reported. The first one was the most appalling and happened 30 odd years ago in a tenement house. There was no hemorrhage but the shock was severe. We infused this woman with a saline solution, gave her morphia, and she recovered from the shock promptly.

There is one point I would like to make in regard to the use of anesthesia and that is there is no anesthetic that will relax the cervix so perfectly as chloroform. Gas or ether will not do it.

I take the stand with Dr. Findley that the vaginal procedure of reposition is the safer one because in the cases we have seen so far we have not lost any and have operated by the vaginal method. In two cases where we could not relax the cervix, we have split the cervix, reinverted the uterus through the enlarged ring, and followed with firm packing.

Another point which must be emphasized in regard to hemorrhage is that whether it be placenta previa or inversion, these patients will not stand any operative procedure unless they are previously transfused.

DR. F. C. IRVING, BOSTON, MASS.—Dr. Huntington, Dr. Kellogg, and myself have had six cases of inversion. They have all been treated by abdominal operation, and all six have recovered. The time when operation was instituted following the appearance of inversion varied from one-half an hour to twelve hours. In three of these cases previous attempts had been made to reduce the inversion from below, but the hemorrhage was so severe and the attempt so fruitless that it was abandoned. All cases were transfused at the time the operation was started.

The operation as we have done it is not very complicated. All we do is to open the abdomen in the midline, the inversion presents itself, and the operator and his assistant reach down, grasp the uterus with forceps and both pull at the same time. They reduce the inversion in the reverse order from which it went down so that it is like putting a stocking on wrong side out and pulling it over your foot. We have seen no shock whatever. As a matter of fact, the patients come out of their previous shock as soon as the uterus is reinverted.

DR. BARTON COOKE HIRST, PHILADELPHIA, PA.—I have had six cases of inversion of the uterus; three were reduced by taxis and three by Spinelli's operation. It is not to report these cases but to record an observation that is very unusual that I take part in this discussion.

My predecessor, Dr. Penrose, one of the founders of this Society, said he was consulted by a farmer's wife in Pennsylvania who had a complete inversion of the uterus for which he proposed the application of weight, which many used in those days. The woman refused treatment, returned to Philadelphia a year later, and to his great astonishment he found her three months' pregnant with a spontaneous correction of the inverted uterus.

DR. FREDERICK C. HOLDEN, NEW YORK, N. Y.—There were three cases of puerperal inversion of the uterus admitted to the Gynecological Department of Bellevue Hospital during a period of nine months, which present points that may add to the interest of Dr. Findley's paper.

CASE 1.—Immediately after the third stage of labor patient had a severe hemorrhage, went into shock and was transfused. No vaginal examination was made before her discharge on the eighth day postpartum. She had two normal menstrual periods, but following the latter she had a severe hemorrhage and was transfused at the Jersey City Hospital. Upon examination they found an inverted uterus which they were unable to reduce. Patient was admitted to Bellevue Hospital where the diagnosis of complete inversion was confirmed. After two weeks of high elevated foot posture and hot saline douches the uterus spontaneously replaced itself, and she was discharged recovered.

CASE 2.—Patient had inversion following forceful Credé at which time she was transfused. Admitted to Bellevue with complete inversion. The condition was not benefited by posture and douches, and uterus could not be replaced under full ether anesthesia. A Spinelli operation was performed, pre- and postoperative transfusions were given, anterior and posterior culdesacs were drained. She recovered after a somewhat stormy course. One and a half years later she was admitted to the obstetrical service in active labor. Following the spontaneous delivery of a full-term breech she went into profound shock, diagnosis of ruptured uterus was made, and a rapid supracervical hysterectomy was done with pre- and postoperative transfusions. The abdominal condition remained excellent, but she developed a bronchopneumonia from which she died one week later.

CASE 3.—Primipara, aged 16, admitted very anemic three weeks after a home delivery. Complete inversion of the uterus, not reduceable by several weeks of posture and hot douches, nor under full anesthesia. Spinelli operation was done, with drainage of anterior and posterior culdesacs and pre- and postoperative transfusions, followed by a smooth convalescence and good recovery. Normal menstruation since.

Comment.—Pregnancy following Spinelli operation should be terminated by an elective abdominal section.

DR. F. L. ADAIR, MINNEAPOLIS, MINN.—We have had two cases of acute puerperal inversion in the Minneapolis General Hospital, and both patients died.

CASE 1.—I saw the patient only after the uterus had been replaced. Patient was a primipara, 28 years old, admitted on April 26, 1925, two hours after membranes had ruptured. Only slight pains during the day and no progress was made. Floating head until April 27. Patient was delivered at 7:10 P.M. on April 27. Prior to delivery the cervix showed at the vulva. Following delivery, the uterus was firm, about one finger below the navel; very slight bleeding. Placenta seemed to be attached to the fundus. There was a slight dimpling in the center of the fundus where the placenta seemed to be attached. The placenta came down after twenty-five minutes, with slight pressure from above. No Credé was used. The placenta lay in the vagina and was gradually and carefully pulled out, but seemed

attached, and when it emerged from the vagina was followed by a large cone-shaped mass of blood oozing from its surface. No uterine corpus could be felt in the lower abdomen. This mass was replaced but came down slightly and was again replaced. Patient bled rather freely, but her condition was fairly good, pulse 104-130. Further interference was not advised, supportive treatment was given with fluids and transfusions; also $\frac{1}{2}$ c.c. of pituitrin and ergot was given hypodermically. There was a first degree tear of the perineum. Total blood loss was about 1000 c.c. Patient returned to bed and condition became worse, and in spite of stimulants and hypodermoclysis, she died while being transfused about three hours after delivery of the placenta. Total duration of labor about thirty-four hours. Baby survived in good condition.

CASE 2.—This case is the only one I have ever seen with the uterus inverted. Patient, aged 29, grav. vii, para v., admitted December 23, 1928. Pregnancy at term, in labor. All previous deliveries were spontaneous. This pregnancy normal throughout. Patient started to have pains at 1:30 A.M. December 22. Pains continued for about five hours, stopped and began again at 6:00 P.M. At time of admission, 12:30 A.M., December 23, pains were coming about every twenty minutes. Later patient had severe labor pains at intervals of eight to ten minutes for about twelve hours with slow progress. Pains then came closer together but still no progress, so she was given rest with morphine and magnesium sulphate. A diagnosis of L.O.P. position was confirmed by x-ray examination. Patient continued to make little progress and became very much exhausted. At 10 P.M. dilatation and effacement were complete, and then because of the posterior position and maternal exhaustion a version and breech extraction were done. A normal female infant weighing 4258 gm. was delivered at 10:55 P.M., with no perineal lacerations. Placenta was delivered easily with no traction on cord and only slight pressure on fundus at 11:12 P.M. Blood loss at delivery was 350 c.c. Condition of patient immediately after delivery was good. A small hemorrhage occurred when patient was being moved from delivery table. The uterus was gently massaged and pituitrin 0.5 c.c. was given and later repeated. At 11:50 P.M., 55 minutes after delivery, patient began to have profuse vaginal hemorrhage and called to the nurse that she had passed something. On immediate examination the uterus was found to be completely inverted, lying between her thighs, and bleeding profusely. Patient was in severe shock. Blood pressure was about 70 systolic, pulse not perceptible at wrist; extreme restlessness and pallor were noticeable. External heat was applied, morphine sulphate gr. $\frac{1}{6}$ given and intravenous saline started at once. An attempt to replace the uterus was unsuccessful, so hot sterile saline packs were applied to control the hemorrhage, and 1000 c.c. normal saline given. Pulse became better in quality. Patient complained of severe pain in abdomen with desire to bear down. She was then taken to surgical department and uterus replaced and packed. Condition was critical at this time. Death certified at 1:25 P.M., two and a half hours after delivery. Autopsy diagnosis: Postpartum inversion of uterus with hemorrhage and shock, clinical. Very mild bronchopneumonia. Unexplained toxic changes in liver, spleen, and kidneys. Obesity. Streptococcic septicemia. Culture of spleen showed streptococcus. Examination of the uterus showed an apparently relaxed lower segment.

There has been some mention of degeneration of the uterine muscle as a predisposing cause. Microscopic examination was made of this muscle, and the muscle and fibers were found absolutely normal; the fat stain revealed no evidence of degeneration.

DR. JOSEPH BRETTEAUER, NEW YORK, N. Y.—In view of the seriousness of this complication, I would like to call the attention of teachers in medical schools and in training schools for nurses, to the importance of instruction in the proper

care of the patient during the third stage of labor. It is surprising to those who have witnessed the energy employed by young assistants and nurses in handling the fundus during the third stage, that this condition has not occurred more frequently.

DR. E. L. KING, NEW ORLEANS, LA.—I saw an inversion in a case of placenta previa. The patient was moribund. The uterus was easily replaced but the patient died shortly afterward.

I know of two other cases of inversion occurring in private homes, one in the practice of my brother, who has delivered about 3,500 patients, and the other in the practice of a physician of less experience. Both uteri were manually replaced at once, and both patients recovered.

DR. L. A. CALKINS, UNIVERSITY, VA.—I would like to report one case of what we thought was inversion of the uterus, in view of its value from a differential diagnostic viewpoint. This woman was admitted to the University of Virginia Clinic approximately a year after an incomplete abortion which had been treated by curettage. She had a large mass protruding into the vagina and covered with a very thick endometrium. Diagnosis of inversion was made and vaginal reposition attempt failed. Examination by laparotomy, however, revealed a hernia, posterior to uterus and down into the vagina. There was a loop of intestine caught in this hernia, but the woman had no signs of intestinal obstruction. We were rather ashamed of our diagnosis, but in view of these reports this morning I think it worth while to report this case as a point in differential diagnosis.

DR. CHARLES C. NORRIS, PHILADELPHIA, PA.—I would like to place on record a case which is perhaps a little different from those reviewed this morning. The patient was a very stout individual who had been delivered by high forceps six months before I saw her. She was sent to me with a diagnosis of submucous myoma and this was the superficial appearance of the tumor-like mass which presented from the vagina. Bimanual examination was unsatisfactory on account of the extreme thickness of the abdominal wall; however, on deep palpation what appeared to be a small uterus could be felt; no cupping could be detected. On account of the size of the uterus and history of the case an inversion was suspected, and the diagnosis verified under anesthesia. The fundus resembled Dr. Findley's specimen but was considerably smaller. It was impossible to replace, and a vaginal hysterectomy was performed with a successful result.

DR. ALEXANDER M. CAMPBELL, GRAND RAPIDS, MICH.—I would like to report a case of puerperal inversion of the uterus in which I attempted the Spinelli operation on the fifth day. I found in this case that this procedure was mechanically impossible and instead did a rapid supravaginal hysterectomy using a continuous circumferential suture to control the hemorrhage. Following the operation a direct blood transfusion was performed, and the patient recovered after a prolonged and stormy convalescence.

I agree with one of the previous speakers who remarked that the Spinelli operation is not always easy to carry out.

A Preliminary Report on Temporary Roentgen Castration in the Treatment of Subacute Pelvic Inflammation, by DR. JOHN O. POLAK, Brooklyn, N. Y. (For original article, see October issue, page 580.)

DISCUSSION

DR. C. F. BURNAM, BALTIMORE, MD.—Many gonorrheal inflammatory cases, as well as puerperal infections, light up at each menstrual period and, at that time,

the pain of the so-called endometriosis inflammatory disease is much exaggerated while often not present at any other time. It is well established that in inflammatory cases intrauterine radium treatment is dangerous, and the same can be said of full doses of x-ray.

It should be borne clearly in mind, however, that by the use of a fractional dose method it is possible, in inflammatory trouble, to produce an amenorrhea without stirring up the infection. As a rule, a period of amenorrhea, whether the inflammatory condition be of neisserian, tuberculous, endometriosal or streptococcal origin, is accompanied by subsidence of symptoms and improvements in the condition.

In addition to a beneficial effect from bringing on amenorrhea, x-ray application in proper dosage has a pronounced healing effect on tuberculous lesions, particularly on tuberculous salpingitis and peritonitis.

DR. JOHN A. McGLINN, PHILADELPHIA, PA.—It seems to me that with our modern treatment of acute pelvic inflammatory disease and the results which we obtain by rest and the treatment which Dr. Polak has already outlined, to introduce an added treatment which brings so much risk as irradiation, is unwise.

I have one patient under my care at the present time who had a very small dose of x-ray ten years ago, and she has never menstruated since.

It has been my experience to handle a number of cases after radiologists had treated them for hemorrhage, and I have had to operate frequently as a result of the lighting up of an old infection by their treatment. Furthermore, in many of the cases of sepsis if left alone the patients will recover and may bear subsequent children. While we cannot say just what effect radiation may have on the offspring as a result of preconception radiation, nevertheless, there is enough in the literature to show that this is a rather dangerous thing at times for the offspring.

Before adopting this measure all these things should be thought of: The possibility of sterilization, of stirring up the infection, and the possibility of an effect on the fetus from preconception radiation.

DR. CHARLES C. NORRIS, PHILADELPHIA, PA.—Irradiation has been employed in certain of the German clinics for these cases for some time. In our own clinic at the University of Pennsylvania we have felt that irradiation was somewhat hazardous in that it was prone to produce an exacerbation of the intra-peritoneal infection, and a history or palpable findings of an inflammatory disease is, therefore, with us a contraindication to this form of treatment. On the other hand, we have employed irradiation in some 600 or 700 patients suffering from benign hemorrhage with only three in which a reaction occurred. It is certain that some of these cases had an unsuspected salpingitis associated with the myoma, or other lesions.

If the adnexal lesions are sterile, as they will be in nearly all cases, if they have been quiescent for a period of a month or more prior to operation, the irradiation is harmless. If, however, the tubes and ovaries harbor virulent organisms, a flare-up is likely to result. In the ordinary dosage neither x-ray nor radium are sterilizing in their action. Certainly intrauterine irradiation by radium preceded as it usually is by a curettage would be more prone to cause an exacerbation than would the x-ray therapy.

If my assumption is correct that irradiation is harmless when the tubal contents are sterile, but is prone to produce an exacerbation when this is not the case, this will explain why a long series of myomata may be treated by irradiation without the production of a reaction. However, the difficulty in the employment of irradiation for cases of pelvic inflammatory disease is that it is impossible always to determine this point.

With the tubercle bacillus the problem may be somewhat different. X-ray therapy has been employed in the treatment of tuberculous peritonitis with more or less success in many recorded series of cases. The theory has been advanced in regard to these cases that whereas the rays are not destructive to the organism, stimulation of connective tissue occurs and tends to wall off and inhibit the offending microorganism.

For the reasons already stated I believe we should employ x-ray therapy with extreme caution in all cases of pelvic inflammatory disease and then only after other and less hazardous methods have proved ineffectual.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—During an enforced stay in the Adirondacks a few years ago, I noticed that women who had pulmonary tuberculosis (patients in sanatorium) would have a rise in temperature every 28 to 35 days. One could follow the menstrual cycle by studying the temperature charts of these patients. It occurred to me that if temporary sterilization was done on these women the temperature would not rise periodically.

It was with a great deal of difficulty that I persuaded the authorities to try out this idea. Finally a few cases were treated in this way by the x-ray, and, as we suspected, no rise in temperature was noticed during the expected menstrual period. Everything else being equal, the temperature of a female patient with pulmonary tuberculosis does not rise quite as high as when she is menstruating, so that evidently there is something in the act of menstruating that produces this rise in temperature. Reasoning by analogy, the chronic inflammation case should react in the same way.

DR. JOSEPH L. BAER, CHICAGO, ILL.—Radiation therapy can cause devitalization of tissue, a result that should militate against its use in this connection. Those of you who have seen the magnificent Cinti film must be convinced that radiation has a definite effect on the vitality of tissues. The way in which the motion of the normal cell structures is gradually and completely suppressed by radiation and the destruction of the cellular elements in the malignancy picture under the microscope are a dramatic and ocular demonstration of the destructive power of radiation on cell vitality. With that thought in mind I agree with those who warn against too ready an adoption of temporary x-ray sterilization as an aid in the treatment of pelvic inflammation.

DR. GEORGE H. NOBLE, ATLANTA, GA.—We know the effect of x-ray on menstruation, but do not know in what way it acts, whether by destroying the germ cells or atrophying the ovaries and uterus, nor do we know of any undoubted effect upon the fetus of subsequent pregnancies. It has not been definitely shown that irradiation may affect subsequent offspring.

DR. JOHN O. POLAK, BROOKLYN, N. Y. (closing).—I think we should not be confused by the discussions we have listened to relative to radium versus x-ray or by the remarks of my friend, Dr. Baer, who has been showing us what x-ray will do in the destruction of cells. There is no question that radium will light up trouble and that x-ray given in sufficient doses will do exactly what he has said. I have presented this as the result of a clinical study that has helped us to shorten the convalescence of these women, and I am fully in agreement with what everybody has said. In order to cure these cases it is necessary to remove the husband and give the patient time to get well. How long it will take is a question. And how can we shorten that time? We know positively that in our cases with mild x-ray dosage, of which we have given the exact technic, these women will be given temporary periods of amenorrhea. As a result of this the inflammatory processes

absorb rapidly and the patients become comfortable, free from pain and are symptomatically cured in a shorter time than with all the methods we have previously used.

I agree furthermore that these cases should not be rayed while they are active. It is after they have been quiescent that we ray them. The point that I am trying to make is that a great many women are operated upon unnecessarily. I hope to have more cases of pregnancy to report in future. So far we have only one out of the 34 cases we have treated. Seven of these cases were operated upon and the rest of them are absolutely well without operation.

The Kidney of Pregnancy, by DR. JOHN C. HIRST, Philadelphia, Pa.
(By invitation.) (For original article, see October issue, page 528.)

DISCUSSION

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—I was very much interested in one of the last statements the speaker made, that he found no definite relations to the late toxemia and hydronephrosis and pyelitis. This is very definitely our experience in St. Louis. I was somewhat astonished that he felt that the kidney lesion in late toxemia is the primary thing and that the liver is secondary. I do not wish to give the impression that I believe that the liver is the primary condition but it is one phase of eclampsia and the kidney lesion is the other. Whether or not either one of these is the primary factor, I believe we are not able to say until all phases of eclampsia are better understood. The usual kidney lesion seen in late toxemia is very definite and, I think, secondary in origin. Just how the lesion is produced, it is difficult to say.

I feel that there occurs in the kidney a spasm of the arterioles leading to the glomerulus, such as is easily demonstrated in the vessels of the nail bed. It is reasonable to assume that it may occur elsewhere. Thus one might assume that the blood flow through the glomerulus is restricted and the subsequent degeneration of the glomerular cells and cells of the convoluted tubules to be due to inadequate blood supply. Usually this degeneration has reached only the stage of so-called albuminous degeneration, and very little necrosis occurs. Occasionally an arteriolitis of the vas afferens develops. If this does not occur or is not marked, the kidney promptly recovers after delivery.

DR. JOSEPH L. BAER, CHICAGO, ILL.—I experience some paternal pleasure at hearing some one other than myself introduce capillary microscopy into the discussion. It belongs in the type of work that Dr. Hirst has done. I think he will be convinced of its value as a diagnostic aid if he will use it.

Beyond that which Dr. Schwarz has discussed there is the preexisting nephritic damage that persists after pregnancy, the type classified by the essayist as the chronic late gestational toxemia. In these patients the capillaries show permanent and gross distortions which are obviously evidence of prolonged disturbance in the capillary circulation, whereas those patients with an acute toxemia in late gestation show the capillary angiospasm of which Dr. Schwarz spoke.

DR. GUY L. HUNNER, BALTIMORE, MD.—Hofbauer's beautiful work showing the great changes in the entire upper tract, but particularly about the lower end of the ureter, has been most illuminating. There is a great field for work to show just how nature provides for overcoming this physiologic disturbance during pregnancy.

The pregnant woman who develops an acute pyelitis may recover spontaneously in ten days or two weeks just as the nonpregnant does. We are, however, more

particularly interested in those cases that do not clear up spontaneously, the type later seen by the urologist because of chronicity or recurrences. In those cases I have found that the large majority are dependent on chronic narrowing in the ureter. I think that in most instances this narrowing is present before impregnation, and treatment of the narrowing and getting good dilatation enable the patient to go through to term.

A more striking and more interesting type of case is the one that Dr. Hirst mentions, the patient who does not show dilatation but, on the contrary, a lessened capacity in the upper tract, the patient who has had multiple abortions apparently due to kidney failure. I wish to emphasize that there exists in a great proportion of these cases a bilateral ureteral stricture. Do not depend for diagnosis upon whether or not a plain catheter will pass easily. A plain catheter will go through two thirds of all strictures without appreciable obstruction. And do not depend on x-ray plates in these cases. The kidney in most of them, shows a hypoplasia and the pelvis is smaller than normal, the content being only 3 to 5 c.c. perhaps. I have had some of these cases, which, after multiple abortions, have gone through to a full-term pregnancy after bilateral ureteral drainage.

A Study in Syphilis Based Upon Two Hundred and Fifty Fetal Autopsies, by DR. JAMES R. McCORD, Atlanta, Ga. (By invitation.)
(For original article, see October issue, page 597.)

DISCUSSION

DR. FRED L. ADAIR, MINNEAPOLIS, MINN.—In something over a thousand autopsies we have had only 46 cases of proved syphilis, a percentage of 4.4. Most of these were premature infants. Relatively few fetuses were born alive and only a few born at term.

In the accompanying six graphs the weights of various organs of syphilitic and nonsyphilitic fetuses are plotted against body weight.

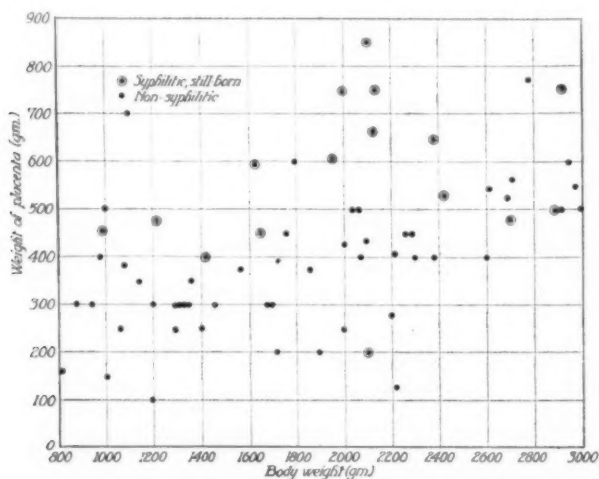


Fig. 1.—Placental weight plotted against body weight. The solid dots indicate nonsyphilitic fetuses, and those with circles indicate the syphilitic fetuses. The placental weight tends to run higher for syphilitic than for nonsyphilitic fetuses.

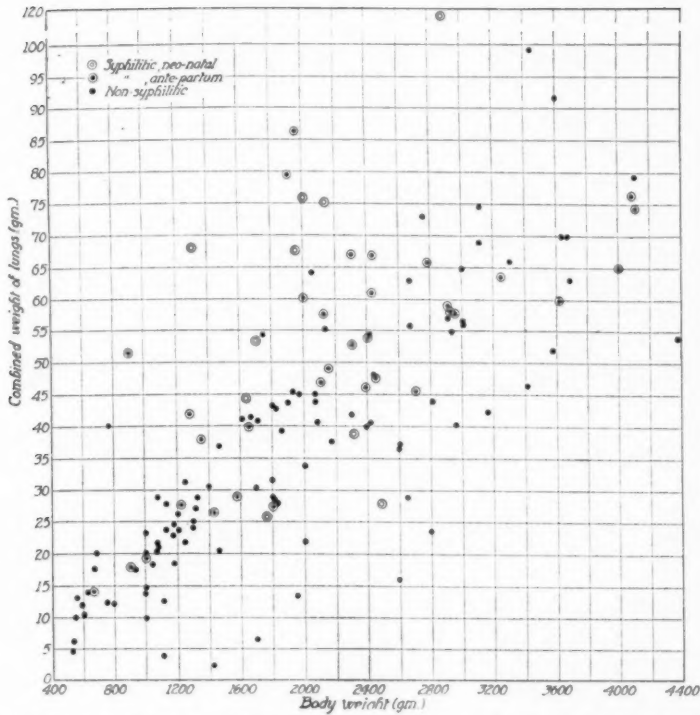


Fig. 2.—Combined lung weight plotted against body weight for syphilitic and non-syphilitic fetuses. There does not seem to be such a marked difference between the lung weight of syphilitic and nonsyphilitic fetuses as compared with body weight. A few isolated cases show an abnormal lung weight for the syphilitic fetuses, and most of these showed evidence of pneumonia alba.

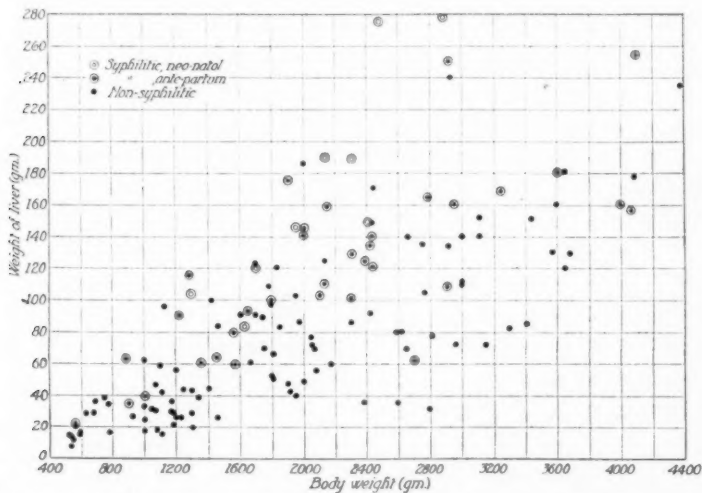


Fig. 3.—Liver weight plotted against body weight indicates a definitely higher organ weight for the syphilitic than for the nonsyphilitic fetuses.

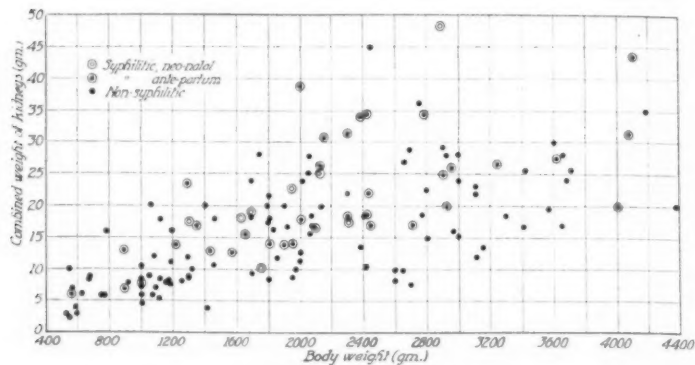


Fig. 4.—Combined kidney weight compared with body weight. There seems to be a definite tendency to a proportionately higher kidney weight in the syphilitic group.

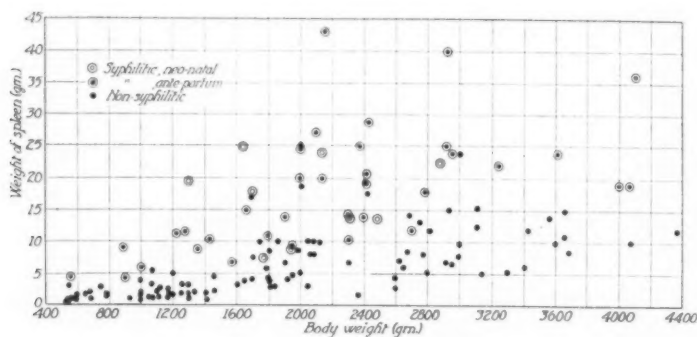


Fig. 5.—Weight of the spleen plotted against body weight shows a definitely higher weight for the spleen in the syphilitic cases.

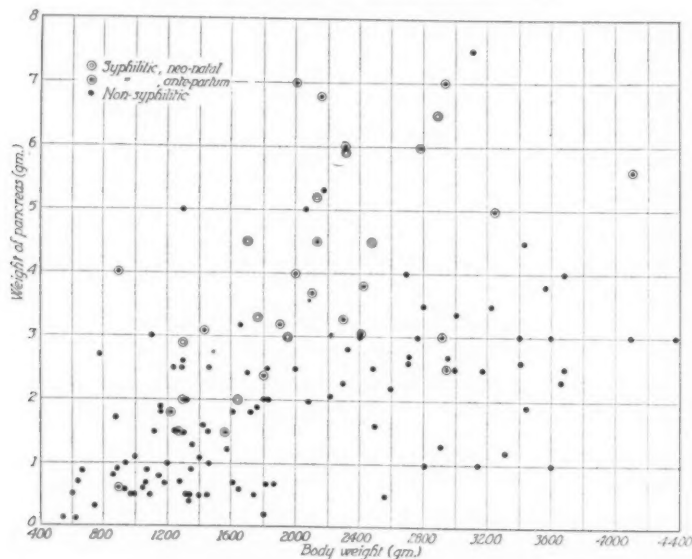


Fig. 6.—Pancreatic weight plotted against body weight shows a slight tendency to a relatively higher weight in the syphilitic fetus.

It is interesting to note that in 31 of 46 cases no clinical diagnosis of syphilis had been made prior to labor. This indicates further need for prenatal care in the attempt to eliminate syphilitic deaths of the fetus.

DR. E. L. KING, NEW ORLEANS, LA.—In the Charity Hospital in New Orleans among the colored patients we have about 18 per cent showing a positive Wassermann reaction, in white patients the percentage is about 2.5. Many of them do not give clinical evidence nor a history of syphilis. We routinely treat all women with positive Wassermanns by arsenicals. One patient came to us with a previous history of a stillbirth, and we only had time to give six doses of salvarsan before delivery. The baby was alive and, of course, syphilitic. We believe that routine Wassermann is of great value on account of the high incidence of syphilis in colored patients.

Leucoplakic Vulvitis and Cancer of the Vulva. Etiology, Treatment and Five-Year Results, by DR. FREDERICK J. TAUSSIG, St. Louis, Mo. (For original article, see October issue, page 472.)

DISCUSSION

DR. THOMAS S. CULLEN, BALTIMORE, MD.—Dr. Taussig has covered the subject in a masterly fashion. While he was discussing leucoplakia of the labia, I could not help thinking of the milky patches in the mouth. A certain number of these in due time will develop into cancer. If all of them are operated on promptly, subsequent cancers from such patches are eliminated.

In some cases of leucoplakia of the vulva it is very difficult to cut away all of the diseased tissue without causing considerable distortion. In such instances it is occasionally wiser not to attempt to bring the cut edges of the wound together but to use an ample number of pinch grafts.

While discussing the subject of cancer of the labium, let me mention a patient who had an inoperable choriocarcinoma of the uterus. One of the Bartholin's glands was 2 or 3 cm. in diameter. On making gentle pressure on the enlarged gland, a thin, flat ribbon of tissue emerged from the gland duct. This substance on histologic examination proved to be choriocarcinomatous tissue, chiefly of the syncytial type.

Block dissection is without doubt the wise procedure in cases of carcinoma of the vulva, and it is preferable, if possible, to do the entire operation at one sitting.

When cutting away the cancerous growth, I have generally employed the cautery knife; and when the growth has been removed, I have cut away the burnt edges of the wound made by the cautery with a knife and approximated the wound edges. In this manner transplantation of cancer cells has been reduced to the minimum.

DR. STEPHEN RUSHMORE, BOSTON, MASS.—There are a few general considerations, suggested or implied by what Dr. Taussig has said, which I want to emphasize. If one looks back into the literature of the subject, the first thing that impresses one is the confusion that has existed, certainly up to recent times. Recent studies have tended to indicate that there is a single underlying process involved in this group of conditions, and the most reasonable view is that we have to deal with a chronic vulvitis, which under certain conditions leads to atrophy, under certain other conditions which are not clear leads to hypertrophy, of which leucoplakia is one manifestation. It is difficult to conceive of a single process that leads to atrophy and at the same time to hypertrophy, side by side. Occasionally we find what we may like to interpret in this way. In acute atrophy of

the liver and some other toxic conditions there is marked degeneration of the parenchyma, even to necrosis. If the patient does not die at once, regeneration of liver tissue begins promptly, often with hypertrophy and sometimes hypertrophy in which cancer has apparently developed. The important clinical fact for us to keep in mind is that in the vulva, if chronic inflammation is associated in its development with hypertrophy manifested in leucoplakia, in a relatively extraordinary number of cases, carcinoma will develop. The way to treat them is, just as soon as we discover that hypertrophic changes are occurring, to remove that area of hypertrophy as extensively as may be necessary in order to prevent carcinoma. This is apparently not true in certain other regions of the body, but leucoplakia hypertrophy of the vulva means carcinoma later in a tremendous number of cases.

What has impressed me most in this study is the remarkable number of recoveries. Carcinoma of the uterus we can cure. Carcinoma of the vulva, a slow-growing process, is very difficult to cure, but with the remarkable number of cures Dr. Taussig has presented I think we all must feel very much more hopeful.

DR. JOSEPH BRETTAUER, NEW YORK, N. Y.—Leucoplakia of the vulva was formerly called kraurosis, after Breisky's publication in 1885. Although this condition is not met with frequently, my records contain at least a score of cases which continued without change for from ten to thirty years; some without any treatment, and others with excision of the entire vulva. None of these cases had the slightest similarity to the pictures shown on the screen by Dr. Taussig. Tumefaction was absent invariably; a purplish discoloration and atrophy of the entire skin from the symphysis down to the rectum were characteristics; none of them developed malignant disease.

The few cases of primary carcinoma of the vulva which came under my observation did not develop on a leucoplakic basis; they proved to be the most virulent type of malignant disease I have met with. None of them lived more than two or two and one-half years, although the inguinal glands were removed as completely as possible.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—Would Dr. Taussig in closing state whether he is still doing this operation in two sittings, as he was doing some years ago?

DR. GEORGE H. NOBLE, ATLANTA, GA.—Radium, though painful, is effective before metastasis has developed but cannot take the place of surgery, for the latter has a wider field of application. It is my opinion that, as a precautionary measure, early removal of the spots is the best procedure.

In removal of leucoplakic spots about the anus, Dr. Taussig states he leaves a bridge of skin to prevent stricture even though all of the diseased area may not be removed. This can be overcome by pulling down the anterior and lateral walls of the rectum until excess of the tissue fills and protrudes beyond the anus. The anterior and side walls of the rectum are loosely attached and several inches of the rectum may be drawn down as I do in complete laceration of perineum and annular stricture of rectum.

DR. EMIL NOVAK, BALTIMORE, MD.—In Dr. Taussig's paper two points stand out as especially important. First of all, it is about as clear a presentation as one could wish of the importance of so-called precancerous lesions. It is natural to draw a comparison with conditions encountered in the cervix uteri. While everyone feels that chronic inflammations and erosions of the cervix predispose to cancer, nevertheless the actual proportion of such lesions which are followed by malig-

nant disease must be comparatively small when we consider the very great frequency of the chronic irritative lesions in question. Certainly in the case of the cervix it is nothing like the 50 per cent incidence given by Dr. Taussig for the vulva. It surely is much better to remove these "precancerous" lesions before they become cancerous than to try to cure the cancer after it has developed. Here we have a real field for cancer prophylaxis.

What secondly impressed me were the remarkably good operative results reported. My own experience has been more like that of Dr. Brettauer. How are Dr. Taussig's good results to be explained? One may think that he has been unusually fortunate in encountering chiefly early and favorable cases, though this is not likely. The other explanation which suggests itself is that some feature of the operation he carries out is a real advance on that which most of us perhaps have employed. Many, perhaps most, operators have been content with the excision of the superficial inguinal glands, and it is the excision of the deeper glands, as practiced by Dr. Taussig, which suggests itself as perhaps explaining his unusually good results.

The procedure recommended by Dr. Taussig to prevent postoperative contraction about the vaginal orifice commends itself to me as being well worth while adopting.

DR. CAREY CULBERTSON, CHICAGO, ILL.—The lesions of the vulva are predisposing to carcinoma just the same as the lesions of the cervix. Dr. Taussig has presented this matter before but never with such finality as on this occasion.

One point in regard to the technic. In his previous reports Dr. Taussig has emphasized the importance of doing Basset's operation first and leaving the inguinal wounds to heal, and then doing the vulvectomy. In my own few cases I have followed that procedure and have been criticized for it. The argument is that if one is operating for cancer one should remove all of it at the same time. In my own experience the separate operations have been satisfactory. In one case of carcinoma of the clitoris we did the Basset operation and the vulvectomy, and the patient is doing well. In my last case I had done the Basset procedure on April 23, finding carcinomatous tissue in the left femoral glands, and last week, on May 17, I did a vulvectomy.

DR. WILLIAM P. HEALY, NEW YORK, N. Y.—At the Memorial Hospital in New York City we have been trying to take care of cases of epithelioma of the vulva for about twelve or fourteen years, beginning with the work done by Dr. Janeway and Dr. Bailey, and we have not been so successful in getting five-year end-results with any method that we have pursued, either with radiation therapy alone, surgery alone, or radiation plus surgery. We are convinced that the crux of the matter depends upon two things, the extent of the disease as far as glandular involvement is concerned and the histologic characteristics of the lesion. There is no question whatsoever that some of the largest lesions are the least malignant and can be cured with excision by knife or cautery. The lesions get into the glands not by direct but by embolic extension. A very large lesion may be relatively benign and the glands be not neoplastic but inflammatory. We feel that it is advisable to treat the cases first by radiotherapy, but we cannot treat an extensive case satisfactorily by radiotherapy alone because there is so much local reaction. In a lesion that is extensive, where we are going to do vulvectomy, we plan to follow up the primary irradiation promptly, within ten days or two weeks at the outside, by at least local vulvectomy. In the meantime the glands in the groin are also being irradiated. If they are not neoplastic or of the first or second grade of malignancy, they will respond to radiation satisfactorily; if of grade one or two, they do not respond satisfactorily and will re-

quire removal. We are of the opinion that for a cancer of the fourth grade, the type that Dr. Taussig referred to in the glans clitoris, surgery is absolutely out of place. The only chance such a patient has of being helped is to be placed under radiation therapy because this is the most malignant type of lesion but, as in the cervix, is distinctly radiosensitive and will respond to radiation therapy.

DR. CURTIS F. BURNAM, BALTIMORE, MD.—The divergence of Dr. Taussig's results from those of Dr. Brettauer can easily be understood when you consider the probable type of case each has had.

There are small cancers of the vulva—just as those of the face—which easily can be cured by excision. There are those of low malignancy which either do not metastasize at all or, if they do, metastasize only to the local glands. Such cases will do well with surgical removal.

On the other hand, there are the high-grade malignancies in which the disease rapidly metastasizes after it enters the glands, spreads rapidly through their capsules, and in these cases the operative results are likely to be discouraging.

Leucoplakia occurs in older people, most likely caused by atrophy of the skin. It seems unlikely that the cessation of ovarian function is anything but a concomitant phenomenon. Leucoplakias vary greatly in thickness, in irritation, and in extent. The localized patches are admirably suited to operative removal. In the widespread areas of leucoplakia, monopolar desiccation offers an excellent method of treatment. It also is very effective in the lesions around the anus where operative removal is technically difficult and bad after-results common. In general, leucoplakias are not favorable objects for either radium or x-ray.

In a high-grade epithelioma which is large and fixed and where there are enlarged glands and fixed glands, radiation is undoubtedly the method of choice; and it is possible to cure by this method some of the cases which are not curable in any other way. It would also seem, as Dr. Healy has pointed out, that for the histologic high-grade epithelioma and those cases unassociated with leucoplakia, radiation, even in the operable cases, is preferable to operation.

DR. FREDERICK J. TAUSSIG, ST. LOUIS, MO. (closing).—While I have had rather striking five-year cures, I am looking forward to the next ten years with some apprehension. My good results may perhaps have been due in part to good luck. As to operative mortality, I have 16 Basset operations without a fatality so far and that speaks very well for its safety. In contrast to the procedure of removing the deep glands through the abdominal route according to Streckel, with a primary mortality of 20 per cent, I think Basset's operation is a safer and more justifiable procedure.

I have been usually following the technic of removing the vulva with the cautery and then trimming the edges with a knife, as suggested by Dr. Cullen some years ago.

In answer to Dr. Polak's question as to doing the operation at two sittings, I am a little disturbed as to how to answer that, for I find myself wavering from one technic to the other. I believe at the present time that if the patient is in good condition for a two-hours' procedure, we had better go ahead and do it all at one time. If she is a poor operative risk, we are safer in doing it in two stages. I believe if the lesion is very extensive and very much infected, it is wiser to remove the vulvar lesion first so as to have a relatively clean field later for the Basset operation, otherwise I would do the Basset first and the vulvectomy later.

Dr. Noble's suggestion regarding the use of the rectal mucosa seems not so applicable in these older women, because if the rectal mucosa pulls away we are

hopelessly lost so far as prevention of a stricture is concerned. I would rather retain the skin bridge on either side to prevent this possible retraction of rectal mucosa.

Dr. Healy's and Dr. Burnam's results with radium and x-ray are, of course, of great value. My own bad results are possibly due to lack of experience. I feel that we should differentiate more than we have in the past not merely as to the malignancy index but as to the point of origin of the carcinoma. Dealing with a glans clitoridis or a vestibular carcinoma we should first do a biopsy and in these cases occasionally employ irradiation, but in every case of the epidermal type I think surgery to be preferable.

Hookworm Disease Complicating Pregnancy, by DR. EDWARD L. KING,
New Orleans, La. (For original article, see October issue, page 569.)

DISCUSSION

DR. M. PIERCE RUCKER, RICHMOND, VA.—When you consider how widespread hookworm infection has been in the South, it is evident that any one who has practiced obstetrics in the South must have had many cases associated with pregnancy, but to have recognized it is another matter. The first Rockefeller survey in Virginia showed that in many counties as much as 66 per cent of the population had this disease. A little later, the second survey showed that the incidence of hookworm disease was reduced 2 per cent to 8 per cent. Inquiry of the Health Department and also of doctors practicing in rural Virginia has failed to show any very evident difference in the obstetric results obtained in these counties.

In 1921, at the Spring Street Home, an institution for unmarried mothers, we had a patient with edema and anemia. We found hookworm eggs in the stools, and this led us to make a survey of the population of the institution. We found 25 per cent infected with hookworm. I thought this possibly might have been a factor in their delinquency. We found these girls coming from rural Virginia. Later we had a city crowd and the hookworm infection disappeared. None of these cases was severe. The lowest hemoglobin was 65 per cent, and there were no obstetric complications. All of them went to term and had live babies. Looking up their histories later, I found that all these patients in the puerperium complained of headache and most of them had red lochia for several weeks. That seemed to be the only clinical difference between this group and the other cases.

In regard to treatment, I am glad to hear Dr. King say that it is safe to treat them during pregnancy. I did not treat any of them until after they were confined for fear of producing abortion. I do not think that the mild infection plays any rôle in obstetrics.

DR. B. P. WATSON, NEW YORK, N. Y.—I had my first experience with hookworm disease just two weeks ago in New York City. The patient had been delivered in the Sloane Hospital two years ago by cesarean section. At that time she had been very anemic with only two million red cells and 40 per cent hemoglobin. When she returned to the clinic in her second pregnancy she was still anemic. We are making a special study of the anemias of pregnancy, and in the course of the routine stool examination the hookworm eggs were discovered. The patient came from the West Indies but has lived in New York during the last six years. The patient is now seven months' pregnant and requires another cesarean. We have been afraid to carry out any treatment for the hookworm disease for fear of dire results. I am glad to have the assurance that treatment can be carried out safely during pregnancy.

DR. E. L. KING (closing).—At first we hesitated to treat these patients. We had one or two instances where the patient aborted or delivered prematurely and lost the baby, but this was not due to treatment. Since we have adopted the procedure of treating them as soon as they are admitted, sometimes several times before delivery, our results have been better. Our system is to treat them every eight or ten days. It takes about that long for the thymol to disappear, and thus we avoid the possibility of thymol poisoning. Since doing that we have had no trouble from abortion or miscarriage. Lambert said he had treated several hundred cases without abortion. Isfram had followed 60 cases, with several abortions, but he felt that the treatment was not responsible. The same experience is reported by Soper.

We had taken it for granted that hookworm disease had been eradicated, and then in New Orleans picked up about 30 cases in a ward that was not a medical ward. The patients came in solely for the pregnancy. It does appear that there is an increased frequency of toxemias in these very ill women.

Trichomonas Vaginalis, Donné, by DR. CARL H. DAVIS, Milwaukee, Wis. (For original article, see October issue, page 575.)

DISCUSSION

DR. CAREY CULBERTSON, CHICAGO, ILL.—Some clinicians find trichomonas frequently in cases of chronic vulvovaginitis; others find it very rarely. I am one of the latter group and thus not the proper person to discuss Dr. Davis' paper with the idea of adding anything new to his very elaborate studies.

There is still some doubt as to what trichomonas is, whether it is pathogenic or not, whether it is identical with the similar organism obtained from the intestinal tract. Parasitologists are not helping us, for they seem to think that it is not a pathogenic organism, but an organism found nonpathogenic in the laboratory may be pathogenic in man. Certainly the work done by Dr. Davis and others would seem to be very conclusive that a chronic vaginitis is due to this organism. This seems to be more common in our private patients of childbearing years, in the multipara, and is not often seen in the nullipara or single patient. We do not seem able to discover the *Trichomonas vaginalis* in the patients who come to the dispensary. At the Cooke County Hospital the same thing is true. Why this should be so is not clear.

DR. FREDERICK C. HOLDEN, NEW YORK CITY.—During the last four months we have isolated this organism by the hanging drop in our office in 19 cases. We have found them in virgins, during pregnancy, and postmenopausal. In one case they were found while a Huhner test was being made. It is interesting to note the variations of symptoms, some women complaining of very little leucorrhea and vaginitis, some being treated for gonorrhea over a long period of time with a great deal of discharge, severe irritation and burning. These cases may be easily mistaken for g.c., as the clinical picture is identical in some cases. Some of these women have been operated on, and others have been in the hands of many doctors for a period of years without relief. To date, we have only one cure, as we do not consider the case cured until we have had negative hanging drops after at least three to four successive menstrual periods, all treatments having been discontinued during this time, not even simple douching being allowed. Most of our cases have not yet had time to fulfill this condition. It is a relatively simple matter to rid the patient of organism and symptoms with a few treatments, but following a menstrual period they usually return with many organisms pres-

ent. For this reason we are now having these patients treat themselves during the menstrual period. They instill 4 c.c. of mercurochrome with an aseptol syringe night and morning, and we hope in that way to shorten the treatment.

DR. HUGO EHRENFEST, St. Louis, Mo.—Dr. Davis mentioned the fact that there is some doubt as to whether there exists a real *Trichomonas vaginalis*. Personally I have been convinced for a long while that there is a specific trichomonas vaginitis for the simple reason that I feel I can almost make the diagnosis when examining the patient. The discharge is peculiarly characteristic. It has a pale yellowish-greenish color and is thin. Furthermore, when it contains little bubbles, one will invariably find the trichomonas.

In regard to examination, Dr. Holden advised the hanging drop. I think that this is an unnecessarily complicated procedure. If you simply put a drop under a cover glass, using a little pressure, you see big fields of leucocytes, and within them small lake-like areas, open spaces probably filled with serum, and along the edges of these clear areas you will readily see the wriggling trichomonas. In this manner the microscopic diagnosis takes only a fraction of the time required for a hanging drop or a smeared stain. There is no doubt that trichomonas are very often found.

My results with treatment are not very satisfactory. Just two or three days ago I saw my first case of typical *Trichomonas vaginalis* in a virgin. I have seen the condition often in pregnant women and I may mention that statistics have been published which tend to establish a relation of the *Trichomonas vaginalis* to puerperal morbidity.

DR. IRVING F. STEIN, CHICAGO, ILL. (guest).—It will require a great deal more work before we have a satisfactory form of treatment. I agree with Dr. Davis that the trichomonas is probably pathogenic. I have looked upon it heretofore as an incidental invader or possibly a symbiotic organism, until I began to concentrate upon the picture, and, as Dr. Ehrenfest has said, the picture is so lucid in a chronic case that immediately the patient tells her story one may suspect that she has a *Trichomonas vaginalis*.

I recently had a patient, a 23-year-old girl, who said that she was willing to have a hysterectomy in order to cure her leucorrhea. Her family doctor had cauterized the cervix three times and had given treatment for a year, had performed a plastic operation on the vagina, but the condition was not improved. The history was absolutely typical of this condition. On inspection we found the picture of diffuse mottling, reddening in the introitus. On separating the labia a stream of milky yellow discharge appeared containing bubbles, which on the hanging drop examination yielded numerous trichomonas. The point about the hanging drop is that if you take the plain drop the pus cells are so numerous that one often finds difficulty in locating the trichomonas, but if it is diluted with physiologic saline solution, they are more easily seen and appear to be much more active. While introducing a speculum the rugae are intensified, and there are often little bleeding points. In the cervix instead of finding the mucopus of a gonococcal endocervicitis one finds a clean endocervix but strawberry-like red spots on the portio that are very characteristic.

The trichomonas found in the vagina may be an offspring of the intestinal type. There are four types described, one type, as you know, is found in the mouth, one in the lung, one in the bowels, and one in the vagina. Dr. Davis was unable by culture to grow the vaginal type on the media used successfully by Heguer for the intestinal trichomonas. Perhaps that is due to their being in a new environment, and perhaps it is a different strain of trichomonas.

DR. JOSEPH P. DELEE, CHICAGO, ILL.—I have had nine or ten years experience studying trichomonas. There are several varieties. Under the microscope you can see two main varieties, one with a little tuft of rapidly moving cilia at the end, and another with a long single cilium that waves quietly to and fro. These latter are the most difficult to cure. Some of the obstinate cases have recovered when I have treated them generally as well as locally. I found by giving them iodine or thyroid, depending upon the basal metabolism, that the local treatment is more successful. So I believe there are certain conditions of the general system that so affect the vagina and its secretions that the soil in which the trichomonas grow is more or less fertile and in treating the general system I have aided the cure. That does not mean that one should neglect the local treatment, and I have found the old remedy recommended by Hoesche is the best, soda and glycerine.

In addition to that, you must cure if possible any associated endocervicitis, so the cautery has its place in those cases that are complicated with trichomonas. I want to mention its relation to puerperal morbidity. It does increase morbidity, and during pregnancy up to six weeks before delivery it is advisable to try to treat the discharge.

In our dispensary service we find it as frequently as in private practice, and in primiparae as much as in multiparae. Very recently a world famous surgeon did a hysterectomy to cure a simple case of this kind. The woman had been driven nearly insane by the irritating discharge and the fear of cancer. At first a doctor took out her tubes and ovaries, a second doctor did a hysterectomy which did not cure the discharge, and a third surgeon removed a granuloma which developed in the vagina and that did not cure it. One of my assistants made the woman comfortable after the third treatment for trichomonas.

DR. OTTO SCHWARZ, ST. LOUIS, MO.—In the cases where the symptoms are unusually frequent and where the organisms are unusually prevalent, what happens to the ordinary bacterial flora of the vagina?

DR. JOSEPH L. BAER, CHICAGO, ILL.—I do want to make just a few points: first, the extreme ease with which the flagellates may be found in the hanging drop with dilution, this being decidedly preferable to the slide in our experience. Second, the frequency with which they are found. There is no question that if we search for them we will find them in a vast number of patients. We have not found trichomonas in women past the menopause, possibly because they thrive best in blood media. In patients under treatment they flourish best just after the menses. No published microscopic study has shown the presence of this parasite buried in the tissue, nor have any actual tissue changes been described which could be ascribable to the invasive pathogenicity of the trichomonas. This has a possible bearing on the conclusion of most of the European clinicians that the trichomonas is harmless and symbiotic. Most of our patients had a preexisting gonorrhea, the trichomonas being found subsequently, both in the presence and in the absence of the gonococcus.

We have thus far failed to convince ourselves that we are really eradicating the trichomonas from the patients whom we treat. We have tried the green soap scrubbing, mercurochrome, lactic acid, sulpharsphenamine and chlorazene dissolved in water and incorporated with glycerine, yet essentially the relief that is immediate can be obtained with a simple glycerine tampon. But the condition tends to recur. At present we are limiting our follow-up treatment to painting with 10 per cent silver nitrate.

DR. N. P. SEARS, SYRACUSE, N. Y.—I have had about fifty cases but cannot give detailed statistics as to the number of unmarried and married women. I find the condition very frequently in virgins and am inclined to believe that the infection comes from rectal contamination. I had one case, a multipara, who had a small rectovaginal fistula, and I have been unable to stop the discharge. The treatment I have used is an old one, a thorough painting with tincture of iodine and a 4 per cent to 5 per cent lactic acid douche. The iodine is used every fourth day and the other treatment given in between. When I first encountered this organism, I tried everything in the vain hope of curing the vaginitis.

DR. E. D. PLASS, IOWA CITY, IA.—I would like to add one observation which may complicate the etiologic aspects of this disease. We have found not infrequently that the infection is complicated by a monilia infection. French writers have described a yeast vaginitis, and in a few instances we have been able by the use of an acid culture medium to grow the yeast. This introduces the problem as to whether the yeast has any etiologic significance. We have attempted to run controls and have found that the vaginal secretion usually does not harbor yeast. Whether there is a symbiosis between the two types of organisms, we are as yet unable to say, but I thought the observation should be reported.

DR. CARL H. DAVIS (closing).—In only one case have I found trichomonas associated with yeast. During the last few months I have had a number of cases of very severe yeast vaginitis and most of these women were past the menopause; only one was menstruating.

In the 50 cases of trichomonas which I have had, it was not possible to demonstrate the gonococcus in a single instance.

I stopped the routine use of silver nitrate and of iodine because a number of patients have developed severe burns which took a long time to heal. Drugs should be used which will only kill the trichomonas without further injury to the already inflamed mucous membrane.

Regarding the changes in the vaginal wall, one finds that after the pus cells begin to disappear there is a tremendous desquamation, and a patient is not considered cured until she has a normal vaginal secretion. If treatment is stopped too soon, the patient will within a few weeks return with a very severe trichomonas vaginitis, and this leads me to believe that perhaps some of the parasites are harbored in the inflamed mucous membrane.

I have had several patients past the menopause with a trichomonas vaginitis.

Patients who do not have coitus, if they are treated sufficiently, eventually show a perfectly normal vaginal bacterial flora.

The symptoms which Dr. Ehrenfest mentioned are perfectly typical of the patient who comes without previous douching or other treatment. If you get a patient with a history of a persistent vaginal discharge insist that she go for at least forty-eight hours without a douche and then you will be in a position to tell whether or not she has trichomonas.

I cannot agree with Dr. Culbertson that this condition is more common in private practice than in dispensary practice. At the Milwaukee County Dispensary it was found that of the women who came in complaining of discharges approximately 33 per cent had trichomonas.

I purposely did not make any statement regarding cures because, while I have a number of patients who have remained cured for more than a year, I am still wondering whether or not there is going to be a recurrence. After another two or three years I will be willing to talk about cures. I cannot agree with Dr. Baer that it is not possible to cure these patients. The treatment used by Dr. DeLee was outlined in our first paper.

Auto Blood Transfusion in Gynecology, by DR. LILIAN K. P. FARRAR, New York, N. Y. (For original article, see *Surgery, Gynecology and Obstetrics*, October, 1929.)

A Review of Breech Deliveries Over a Five-Year Period, by DR. WILLIAM C. CALDWELL AND DR. W. E. STUDDIFORD, New York, N. Y. (For original article, see page 623.)

DISCUSSION

DR. E. B. PIPER, PHILADELPHIA, PA.—In Minneapolis last year, in the obstetrical section, we presented a paper on the routine use of after-coming head forceps, in all difficult breech extractions, to decrease the fetal mortality and also the morbidity. A neurologist followed that paper with a large number of photographs showing the horrible results of breech extractions from the neurologic standpoint. Now we believe and state that this is due, as Dr. Caldwell said, to injury of the tentorium, broken necks, injury to the brachial plexus and injury to the nerves of the cervical plexus, and that these injuries may be avoided by the routine use of forceps.

My own statistics cannot well be compared with those of Dr. Caldwell because I understand all of his were natural breeches, none being produced by version. However, in the Philadelphia Lying-in Service there were nineteen breech extractions with a mortality of three, a percentage of 15, which looks bad. The three deaths were due to premature twins and one twin macerated, and the third was a craniotomy. So cutting those three out we have no deaths due to delivery itself. All were delivered by means of the after-coming head forceps. In the University Hospital we had 38 cases and 7 deaths, a percentage of 18.8. Four of them were premature infants of seven months or more; two were placenta previa; and one had a diabetic mother in whom the fetal heart sounds had not been heard. That explains these seven deaths. Therefore, we had these two series of 19 and 38 breech deliveries without a fetal death due to delivery itself.

I am inclined to think that in doubtful cases of breech delivery, the elective cesarean would reduce the mortality better than any method of delivery.

I do not agree with Dr. Potter's assertion that you can always do an extraction with the anterior arm first. In a recent case I took the posterior arm on one side, started to do it on the other side and could not without fracturing the whole shoulder. I then put on the forceps and got the arm out with the head without a fracture of the arm. One can do many things with the forceps. It is entirely immaterial, I think, what forceps are used, in some cases the old Tarnier forceps, in some the Dewees', depending on what the operator is accustomed to. Personally I like the ones I have designed for myself.

DR. H. C. BURGESS, MONTREAL, CANADA.—Practically all available records show, and most authorities agree, that the infantile mortality in cases of breech delivery exceeds that of vertex presentation, and any contribution that tends toward a solution of this problem deserves to be commended.

In 1924, I reviewed over 18,000 cases occurring in the Montreal Maternity Hospital, and demonstrated that in contracted pelvis, the operation of version and extraction showed a higher infantile mortality than any other method of delivery, except craniotomy; and in a review of the 9,000 cases occurring since that date three important facts stand out very prominently: first, that the operation of version and extraction in this class of case has been performed much less frequently; second, that where attempted, the infantile mortality has been greater than in the previous series of cases; third, that elective cesarean section has been the operation of choice.

As far as I am concerned, the solution of this problem has been reached. Given a breech presentation, I attempt from the thirty-fourth week onward to perform an external version; and where I have been successful in this manipulation, no contrivance has been necessary to keep the fetus in its new position. If I fail in this manipulation, or if there is a history of dystocia in previous labors, or if the diagonal conjugate measures 11 cm. or less, I advise a continuation of this pregnancy and delivery by cesarean section at or near term.

The obstetrical staff of McGill University has decided against teaching of this external version to students, fearing that the inexperienced practitioner may be mistaken in the diagnosis or fail in his manipulation and transform a longitudinal presentation into a transverse. We urge him in this class of patient to study the pelvis, and if he finds any degree of pelvic contraction, to induce labor from the thirty-sixth week onward, and to leave the laboring patient alone until the breech is born through the vulva. For the induction of labor the bougie proves more efficacious than the bag.

DR. HUGO EHRENFEST, St. Louis, Mo.—The importance of external version as a prophylactic measure has been mentioned. Reference was made to the paper by Bartholomew, and at the time when it was presented I cited my own results with external version. I have practiced it routinely for probably fifteen or twenty years. In every discussion of the problem of breech labor and external version some one seems to assert that we do not need prophylactic external version because we can make breech delivery practically free of danger. It is obvious that no fair comparison can be made of statistics on external version submitted by one man with statistics of another man concerning his own results in breech delivery. So I thought I would study the results of both procedures on my own cases. I have analyzed a consecutive series of 518 private cases, all having received proper prenatal care. I found I had made 11 successful external versions in recognized breech presentations with loss of one baby, and in the same series had 11 breech labors with three fetal deaths. The one baby lost after successful external version, as a matter of fact, was sacrificed in an inevitable craniotomy, so that it cannot be counted against external version. Among the three babies lost after breech labor there was one case of enormous cystic degeneration of the kidneys, and that case again should not be counted against breech labor.

That leaves in the entire series only two fetal deaths occurring in breech labors, and the analysis of these two cases proves very instructive. The one was an elderly primipara with a typical, long labor. Baby was fresh dead. With all my experience in version I cannot help feeling that the baby certainly would have had a much better chance if the diagnosis could have been made and a version performed at the proper time. The second case was a woman with a slightly funnel-shaped pelvis. She had in her second pregnancy a breech presentation which was recognized. External version was done and the baby delivered alive. In the third pregnancy I had overlooked the breech presentation and this baby was lost. Personally I am forced to the conclusion that if I had recognized in both these cases the existing breech presentation and done a version, in the one case the baby would have had a decidedly better chance to survive in a vertex labor, and in the other case, with the satisfactory result in the preceding labor, with proper diagnosis and version also this baby would have been saved. So I feel that this series of 518 consecutive labors proves beyond doubt that external version has its very definite advantages and greatly reduces the fetal mortality incident to breech labor.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—I can subscribe to the conservative method of breech delivery that Dr. Caldwell has outlined in toto. I believe that full dilatation of the cervix coupled with plenty of time in delivery is

most important. I believe most of the babies that are lost are lost on account of too much hurry in delivering the breech and after-coming head. At the Methodist Episcopal Hospital, during the past two and a half years, there were 192 breech presentations and 22 versions, making a total of 214 breech deliveries. The percentage of stillbirths was 12.1 per cent. At the Long Island College Hospital during the past year there were 44 breeches with an incidence of 15.2 per cent stillbirths. These figures include all viable babies.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—There is one teaching that we give and try to disseminate: after the cervix is fully dilated and the breech has presented and is out of the vulva, we teach "Do not pull. Let her push and you guide." We try to make that so impressive that our students and our interns will follow it throughout life. The result has been that we do not look upon the breech case as the formidable case we previously did.

I feel, furthermore, in regard to external version that it would have become a head presentation if it had been left alone, or there is a condition responsible for the breech presentation that even external version does not remove. In the cases of minor degree contracted pelvis the elective cesarean section is a life saving procedure in breech delivery.

DR. JOSEPH P. DELEE, CHICAGO, ILL.—Everybody knows and agrees and is willing to admit that injury kills a lot of babies during breech delivery and that hemorrhages into the brain and all the other things mentioned are very common. I wish, however, to make a little qualification that delivery itself does not injure quite all of the babies. I think Dr. Burgess hit the nail on the head in every respect but one. I would qualify his condition for cesarean section. I think that with a large baby and narrow pelvis a cesarean section is the proper thing, but to make the indication quite as broad as he did seems wrong to me. A little test of labor in these breech cases will help a great deal, and therefore I let these women go into labor when I have good reason to believe they will come through all right, and I believe this is the proper thing to teach.

By means of a stereoscopic x-ray study one gets a better idea of the size of the head and its relation to the pelvis than with the simple x-ray. It will also reveal a monster, and the frequency of monsters in breech presentation is remarkable. At the Chicago Lying-in Hospital in 1926 and 1927, 6,031 births in the hospital had an incidence of 250 breeches, 4.1 per cent. The reason for this high percentage is that we have a large number of referred cases of breech delivery. Of these 250 breech cases, breech extraction was performed 166 times, cesarean section 43 times. In the remaining 41 cases the labor was spontaneous or manual aid was necessary. In the 250 cases (103 primiparas, 147 multiparas) there were 24 fetal deaths, 14 babies were stillborn and 10 died later. Deducting from these 24 babies, those dead on admission, monstrosities, syphilitics, intestinal obstruction and the eclamptics, we have a corrected mortality of 14 deaths in 250 breech cases, or 5.6 per cent.

Some of this mortality could be further reduced if we had had autopsies on all of the babies. Omitting the babies that were delivered by cesarean section, we have a fetal mortality of about 6 per cent. Now does that 6 per cent mortality justify cesarean section with a mortality of 1 to 16 per cent of the mothers? Should we not restrict, certainly in our teaching, this operation if with ordinary care the case can be so safely cared for? Would an infant mortality of 6 per cent or even of 10 per cent justify the increase in the already widespread use of cesarean section in breech cases?

DR. E. L. KING, NEW ORLEANS LA.—About a year ago Dr. Gladden and myself reported a series of 159 breech deliveries. We eliminated all premature babies and all babies dead before delivery was attempted; in other words, taking only healthy babies at or near term. We found a mortality of a little more than 10 per cent, 16 babies out of 159. The fetal mortality was higher in multiparas (12 per cent) than in primiparas (6 to 7 per cent). I think that is due to two causes: first, the babies of multiparas were larger—on the average over a pound—than the babies of the primiparas; second, there is a tendency to underrate the seriousness of breech delivery in a multipara.

I feel that external version is a wise practice.

Another factor which influences the fetal mortality is the time of intervention. My teaching is that the case should be left to nature and that assistance should be given only when it is necessary. In hospital work, however, where we have every facility, in most cases I deliver the baby under deep anesthesia as soon as the cervix is fully dilated, especially in a primipara. I believe in that way we have lowered the fetal mortality.

I agree with Dr. Piper that the forceps on the after-coming head is a measure of considerable value. Certainly it has helped me in a good many difficult cases. I also feel that cesarean section is a procedure to be reserved for patients with narrow pelvis, or for elderly primiparas.

DR. WILLIAM C. CALDWELL (closing).—I agree with Dr. Piper that forceps on the after-coming head are frequently useful. Doctors Irving and Goethals were able to reduce the infant mortality in breech presentations over one-third by concentrating the breech deliveries in their own hands.

The mortality in breech presentations will be greatly reduced by not interfering with a normal advancing labor, by thoroughly preparing the birth canal before starting a breech extraction and by taking plenty of time in the delivery even though the baby should inhale some amniotic fluid. Even slight angulation or forced traction is likely to result in serious injuries to the child.

Cancer of the Uterus Complicating Pregnancy, by DR. JOHN A. MCGLINN, Philadelphia, Pa. (For original article, see October issue, page 592.)

DISCUSSION

DR. WILLIAM P. HEALY, NEW YORK CITY.—We feel like Dr. McGlinn that the cancer is the important problem to be considered and that its treatment should be that which we in our individual experience regard as the best suited to the cure or treatment of the existing cancer regardless of the complicating pregnancy. We use at the Memorial Hospital a very massive radium dosage, applied per vagina, and heavy x-ray therapy. With radium applied within the cervical and uterine canals, we expect the fetus to die, certainly that it will not go to term, therefore we ignore its presence.

The question of early diagnosis is the important one; I would like to emphasize the care with which biopsies in these cases should be done before resorting to any therapeutic procedure.

I am inclined to believe we may have a higher incidence of carcinoma in primiparas in the future as the result of the prevailing birth control tendency and late marriages. We now find more women entering the cancer age though still awaiting their first child. Therefore, we shall probably see more cervical cancers in primigravidas.

We are very definitely against hysterectomy in the treatment of carcinoma of the cervix that has developed during pregnancy and prefer to control the lesion with high voltage x-ray and radium.

DR. JAMES C. MASSON, ROCHESTER, MINN.—We saw three cases of pregnancy complicated by epithelioma of the cervix. One patient was about seven months pregnant with an extensive inoperable growth. We allowed her to go another month and then did a Porro-cesarean, obtaining a living child. The malignant growth was treated with radium afterward, but the mother died four weeks after the operation as the result of a pulmonary embolus.

The problem was different in the other two cases. They were both four months pregnant and had very early malignant lesions. I operated both of them. The microscopic evidence of the tissue is very important, and the degree of malignancy found (Broder's classification) should influence us a great deal in deciding whether a case should be treated surgically or by radium or x-ray. Even a small growth of a high degree of malignancy is better treated by radium in most cases. On the other hand, if a small growth is of a low degree of malignancy, the prospect for cure by surgery is very good or, probably better, by surgery plus radium and x-ray. Both of these cases were early lesions and of grade 3 according to Broder's classification. In these two cases I made a combined vaginal and abdominal hysterectomy, first separating a cuff from the vault of the vagina and then going in from above and doing a wide dissection in the base of the ligaments, hoping to avoid cutting into malignant tissue. Both operations were done about eighteen months ago and I saw one of the patients a month ago and have heard from the other regularly every three months. They are both in good condition.

I think one important consideration when pregnancy is complicated by epithelioma of the cervix is the danger of sepsis if the uterus is emptied but not removed.

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—My experience has also been limited to three cases, one 28 years old who about twelve years ago was treated with radium, another two or three years later about 32 years of age, and a patient whom I saw with Dr. DeLee several years ago, about 35 years of age.

I wish to emphasize that cancer of the cervix in a patient who is pregnant is more difficult to diagnose than the ordinary case of carcinoma. The lesion tends to be very much magnified by the pregnancy, just as fibroid tumors often grow much larger during pregnancy. If I ever encounter more patients with extensive carcinoma of the cervix complicating pregnancy, I shall do all possible in therapy even though the outlook appears to be hopeless.

DR. CHARLES A. BEHNEY, PHILADELPHIA, PA. (guest).—About thirteen years ago a patient was seen by Dr. Keene. She was 26 years old and had seven or eight months before been delivered of a normal child. She had a squamous cell carcinoma of the cervix and was about six months pregnant. Dr. Keene did a cautery amputation of the cervix and applied 100 mg. of radium for 36 hours. When seen about two months later the cervix was partly dilated and labor apparently about to begin. She was delivered of an apparently normal child without any great difficulty. Before she was discharged, Dr. Hirst applied 100 mgs. of radium for 36 hours more. The patient is well today, but the child developed into a microcephalic idiot.

DR. WILLIAM P. GRAVES, BOSTON, MASS.—I wish to say a few words concerning the influence of radium on the fetus when it has been applied previous to conception. We have in our series 30 cases where nonsterilizing doses of radium had been given for uterine insufficiency in women capable of later child-bearing.

In following up these cases we found that 13 women had conceived later, there being a total of 20 pregnancies. From these pregnancies there are 8 living children. The remainder of the conceptions ended in abortion or premature birth or in very early death after birth. An attempt was made to determine the physical character of the living children, the data being based for the most part on letters from the mothers. In all cases the mothers reported that there were no deformities, excepting one in which there was said to be some malformation of the nose. From the large percentage of miscarriages it might be inferred that the radium had had some deleterious influence on the endometrium. On the other hand, it must be remembered that all of these patients had been treated for abnormal bleeding and that the tendency to miscarriage may have been constitutional rather than from the effect of irradiation.

DR. FLOYD E. KEENE, PHILADELPHIA, PA.—I will add one other new case. This patient was between three and one-half and four months pregnant, and the cervix extensively involved by a malignant growth. I did a supravaginal hysterectomy and bilateral salpingo-oophorectomy as a primary procedure. Two weeks later, I did a wide cauterization of the cervix and applied 2400 mgh. of radium element. This operation was performed about two years ago, and at the present time the patient is in perfect health with no evidence of malignancy.

I should like to second Dr. Graves' statement regarding preconception irradiation. Dr. Murphy's very careful investigation of this subject, as well as our own experience in following up patients who have become pregnant after irradiation, convinces me that there is little or no danger of deformities or anomalies developing in children born after radium has been used. On the other hand, I am equally firmly convinced that not infrequently very serious abnormalities may follow upon postconceptional irradiation.

DR. G. B. MILLER, WASHINGTON, D. C.—In Veit's handbook can be found a very comprehensive article on carcinoma of the uterus in pregnancy. I think it pays to read it.

I have had only one case, a woman who came to the Columbia Hospital in the eighth month with a cervical cancer which was regarded as incurable: therefore, the doctor who saw her discharged her with instructions to return when in labor. When I saw her I felt more hopeful in regard to cure. She was at term and in labor. I did a cesarean and followed it immediately by a radical Wertheim operation. The edema of the tissues in the pelvis made the separation of the ureters and tissues around the cervix extremely easy. That was done 16 years ago, and the patient three years ago was still alive and well.

DR. JOHN A. McGLINN (closing).—With the increasing use of irradiation in stimulating doses for various functional disorders and for adolescent bleeding in women, this subject assumes great importance. We have fairly definite knowledge of the effect of irradiation on the fetus during pregnancy. We are not so sure of the effect on the fetus of preconception radiation. This is one of the most important subjects in our specialty to be worked out at the present time.

The Significance of Low Arterial Pressure in Pregnancy, by DR. PHILIP F. WILLIAMS, Philadelphia, Pa. (By invitation.) (For original article, see October issue, page 546.)

DISCUSSION

DR. BARTON COOKE HIRST, PHILADELPHIA, PA.—Like most practitioners I have two or three of these cases constantly under supervision, and a puzzling minor complication of gestation it is. I have an advantage over Dr. Williams which he

need not envy. I am seeing my second generation of patients and have under my charge now a young woman who presents this peculiarity in a marked degree. I had charge of her mother when this girl was born, and I believe that her hypotension and general nervous instability had its origin in her intrauterine existence. Her mother had grave domestic difficulties during her pregnancy and this probably accounts for her daughter's low vitality.

Another case can be attributed to the same cause, but the father was at fault. He was in a state of extreme nervous instability and tension when his daughter was procreated. This daughter during her pregnancy not only had a low blood pressure but a curious lack of initiative. Her attendant had to get her out of bed in the morning, make her put her stockings on, brush her teeth and so on, or she would have done nothing on her own responsibility.

My experience differs a little from Dr. Williams' in regard to treatment. If the systolic blood pressure is as low as 80, these patients are put to bed for several days and are given powdered digitalis and strychnia. Almost invariably their blood pressure rises in response to this treatment.

Dr. Williams did not emphasize the fact, if I heard him correctly, that there is a persistent tendency in all pregnant women to a low blood pressure. The majority of pregnant women have a blood pressure under normal. If it is much exaggerated, an explanation may be found in the girl's intrauterine existence. These patients are almost always lacking in nervous vigor and often show more or less imperfect physical development. Under observation and treatment, with periods of complete rest, they can be guided through their pregnancy successfully and need not experience any special difficulty in their parturition and recovery, although it is my routine practice to give them a course of cardiac stimulation for a short time prior to their expected delivery.

DR. HERMAN J. BOLDT, NEW YORK, N. Y.—Is not the low blood pressure mentioned by Dr. Hirst due to a nervous condition rather than to the pregnancy? It is a matter of fact that almost every person who is exceedingly nervous and highly neurotic will have a blood pressure below normal.

DR. BARTON COOKE HIRST, PHILADELPHIA, PA.—The persistent low blood pressure in all pregnant women cannot always have a nervous origin. There is probably something in pregnancy which accounts for it because at other times these patients may be perfectly normal in this respect. The explanation may be found in a lack of muscular development in the left ventricle to keep pace with the added volume of blood that it must propel through the body. In the exaggerated cases under discussion there is, I think, the added factor of impaired nervous vigor.

DR. ARTHUR H. MORSE, NEW HAVEN, CONN.—My personal experience with hypotension has been in those patients who have gone through a prolonged labor, or upon whom an operative procedure has been performed. We have had patients in the wards, and I have personally cared for a number of private patients in whom the systolic pressure was low, though not as low as in the cases which Dr. Williams has reported. I have never been particularly concerned about those patients. Generally the pressure has risen toward the end of pregnancy, and the patient has gone through labor, as far as I have been able to determine, quite as satisfactorily as those in whom the pressure was higher.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—We have in our prenatal clinic quite frequently seen cases of marked hypotension, particularly multiparas, the hypotension becoming evident comparatively early in pregnancy.

The pregnant multipara can tell not infrequently that she is pregnant almost as much from the fact that her leg veins are enlarging, as from the fact that she has missed a period. If she has had varicosities, they become more pronounced long before any pressure could account for it. Undoubtedly there is some substance in pregnancy to which the increase in caliber of vessels is due. We also know that in pregnancy there is an increased blood volume. Considering this, we feel that perhaps the hypotension might be due to the fact that the increase in blood volume does not keep pace with the enlargement of the circulatory bed.

DR. HUGO EHRENFEST, ST. LOUIS, MO.—Both low blood pressure and slow labor have been ascribed to a deficient function of the posterior pituitary body, and it has been suggested to administer pituitary extract during pregnancy. I have never dared to try this medication but would like to know whether Dr. Williams has any experience with the continued use of pituitary extract during pregnancy to raise blood pressure and prevent a slow labor.

DR. CAREY CULBERTSON, CHICAGO, ILL.—This question of blood pressure in pregnancy has been very markedly stimulated in the last 10 or 15 years by the careful observations that have been made in association with gain in weight as a method of estimating such things as pregnancy toxemia. Accordingly we have taken blood pressure on all of our patients, and I have been impressed with the tendency toward low arterial tension throughout pregnancy in many patients.

Dr. Williams placed these patients in the two groups of the asthenic and the energetic types. It is with the asthenic patients that we have to be particularly careful. We have to guard these women in early pregnancy against further loss of weight from vomiting. They often have a bad habit of not eating, acquired long before gestation.

I had hoped that Dr. Williams in giving the blood pressures would also mention the diastolic tension, because I think that the pulse pressure is one of the best indicators of the patient's condition. Those patients with low systolic blood pressure in whom the diastolic is not correspondingly decreased are the ones who complain particularly of fatigue.

I was glad to hear Dr. Williams differentiate between the undernourished and the fat patients. We have to keep the thin patients on frequent feedings, small quantities every four hours. The tendency to toxemia in thin women is not nearly so great as in the fat patients.

DR. L. A. CALKINS, UNIVERSITY OF VIRGINIA, VA.—Has Dr. Williams controlled this asthenic group with hypotension by comparing them with another asthenic group but with normal blood pressures in relation to labor and other unsatisfactory features of the puerperal state?

DR. PHILIP F. WILLIAMS (closing).—In reply to Dr. Ehrenfest I would say that I used pituitary extract, not over a week at a time, three times a day, the patients resting most of that time in bed. It had a very slight effect on increasing the blood pressure.

In making my comparisons with other cases I unfortunately did not do as Dr. Calkins has suggested, that is, compare these cases with an equal number of asthenic women with normal blood pressures, but did compare them with a series of women, a much larger series, taken at random who did have normal pressures and concluded that the duration of labor and the degree of prematurity were considerably accentuated in the hypotensive women.

Basal Metabolism Determination in Pregnancy, by DR. E. D. PLASS, Iowa City, Iowa. (By invitation.) (For original article, see October issue, page 556.)

DISCUSSION

DR. CARL H. DAVIS, MILWAUKEE, WIS.—Dr. Stander wrote a paper some years ago which showed somewhat similar results without the use of iodine, since his patients lived where sea food is prevalent. My patients all had iodine, with one exception, in somewhat larger amounts than Dr. Plass gave, and yet as far as I can follow the charts the results were more or less comparable. In other words, the patients who had perfectly normal thyroids, on the average stayed within normal limits during the period of pregnancy, whereas those who had abnormal thyroids even with iodine showed a metabolic rate above the normal.

Of greatest importance is the observation that when sufficient iodine is given during pregnancy we can practically eliminate congenital goiters. We hope that we will also greatly reduce the tendency to later development of goiter which is now so prevalent and becoming such a problem in certain parts of this country. Those of us who live in the Great Lakes district are seeing a constantly increasing number of women who have evidences of thyroid abnormality. Myxedema, cretinism, as well as the various forms of hyperthyroidism are much more prevalent with us than in other parts of the country.

I was very much interested to hear last summer in de Quervain's Clinic at Berne that, since iodized salts are being used in Switzerland, adolescent goiter has greatly decreased. He feels that the use of the iodine is going to control the problem of congenital goiter.

DR. JOSEPH P. DELEE, CHICAGO, ILL.—This fact might be of interest: By feeding cows the residue from fish factories, chiefly bones left over from canning, the iodine content of their milk can be raised to, I think, 315 parts per billion or even higher. That brings the milk up to the iodine food value of the Columbia River salmon. Experiments are now being carried on in several dairies, chiefly in the Rock River Farms near Chicago. I have been asked whether I would recommend the steady diet of such milk for pregnant women. The iodine after passing from the bones of the fish into the cow's milk, the dairymen claim, is more assimilable and palatable than the iodine obtained from sea kelp. It is also claimed that abortion in cattle has been somewhat reduced under the fish residue régime.

DR. CARL H. DAVIS, MILWAUKEE, WIS.—Some years ago I found that a few of my patients were developing hyperthyroidism within a year after delivery. Following this observation I began to have them continue the iodine during the period of lactation and since then have not had a single patient who has developed a hyperthyroid condition. Whether this is a coincidence or not I am not prepared to state, but Dr. DeLee's suggestion seems worth while.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—I feel that the increase in metabolic rate during pregnancy is not entirely due to the growth of the fetus but also to increased thyroid activity, and this is particularly shown in such cases where thyroid hyperactivity exists already. Apparently Dr. Plass is not of this opinion. In pregnant animals can be observed a marked increase in the activity and a storage of colloid in the gland which disappears shortly after term or even at term. It seems to me obvious that the fetus in utero is under such a condition that its metabolism would be much less than that of a newly born child. In calculating rates of mother and newborn it is in my opinion not justifiable to take the rate of the newborn as comparable to the rate of the fetus in utero.

In view of this fact and in view of the changes of the thyroid in pregnancy, I believe that the increased metabolic rate is in a definite part due to increased thyroid activity.

DR. JOSEPH L. BAER, CHICAGO, ILL.—I published a study of basal metabolism in pregnancy and the puerperium. In that series it was attempted to eliminate any patient with an obviously enlarged thyroid or with symptoms of hyperthyroidism. Today listening to this very exhaustive study of the subject, under much more rigid control of conditions and including a precise study of the thyroid states of the patients, I am glad to see confirmed the figures obtained at that time, particularly because in the meantime two papers have appeared denying any increase in metabolism in the normal woman at the end of pregnancy.

DR. E. D. PLASS (closing).—I think that our clinical results have confirmed absolutely the work done among the lower animals relative to the protection of the infantile thyroid by the administration of iodine during pregnancy. The danger which the average internist considers a bar to the indiscriminate use of iodine has not been observable in any of our patients. We feel that one may give iodine during pregnancy, running only a very small chance of doing damage to those individuals who have adenomatous goiters.

Perhaps I did not explain clearly enough that I agree with those who say that in the perfectly normal pregnancy, with a normally functioning thyroid gland, there is no increase in the metabolic rate due to the pregnancy itself. I believe that is shown particularly by the fact that in the perfectly normal individual there is an extremely abrupt drop in the basal metabolic rate immediately after delivery. If that drop depended upon a regression in the thyroid gland, one would expect it to be slower. Its abruptness is good evidence that the increased rate in normal pregnancy is due practically entirely to the metabolic activities of the fetus in utero.

Important Procedures in the Conservative Treatment of Eclampsia, by

DRS. WILLIAM J. DIECKMANN AND OTTO H. SCHWARZ, St. Louis, Mo.

(For original article, see October issue, page 504.)

DISCUSSION

DR. JOHN W. HARRIS, MADISON, WIS. (by invitation).—I was quite surprised that Dr. Dieckmann reported a marked concentration of the blood in his eclamptics during pregnancy. The experimental work of Stander and Tyler, of Plass and Bogart on plasma proteins seems to show that in normal pregnancy there is a marked dilution of the blood during pregnancy with a subsequent concentration during labor, followed by a second dilution fairly early in the puerperium.

Several years ago Dr. Gray and I found that through pregnancy up to term there was a marked dilution of the blood, with a low cell volume, low hemoglobin and a high fluid volume. During labor there was a marked concentration of the blood followed promptly about the first or second day of the puerperium by a second dilution, and a gradual return to normal fairly late in the puerperium.

It has been stated that the degree of blood dilution in the toxemias of pregnancy is more or less dependent upon the tissue edema. Plass and Bogart, and Stander claim that in eclampsia the blood dilution is more marked than in the normal case.

In regard to treatment we agree with Dr. Dieckmann and Dr. Schwarz. The mild case will recover if let alone. It is in the severe cases that our results are not so satisfactory. The difficulty comes in distinguishing the severe case of

eclampsia from the mild one and determining upon operative procedure early enough before the patient becomes a poor operative risk. In this respect the work of Dr. Dieckmann and Dr. Schwarz is of great value. In the severe cases many of us are coming to believe that conservatism is no longer advisable and, as Dr. Dieckmann said, if prompt delivery cannot be accomplished through the natural passages, cesarean section is to be given serious consideration. In this connection we should take into consideration the work of Stander on the effect of anesthesia on the blood picture. He has recently shown that the experimental use of all the various types of inhalation anesthesia produces the same blood picture that is present in cases of eclampsia. This may well explain why so many of us in the past have had such bad results from cesarean section in the treatment of eclampsia. Stander has shown that even large injections of the usually employed local anesthetic do not produce these blood changes and this might well explain the relatively good results reported by DeLee in the treatment of eclampsia with cesarean. The injection of ephedrin in spinal anesthesia has been a great advance. Spinal anesthesia has the advantage that it is less disturbing to the patient and also that the operation can be done in much less time.

DR. GEORGE W. KOSMAK, NEW YORK, N. Y.—The work of Dr. Schwarz and Dr. Dieckmann, together with that done by others in recent years, is a most valuable contribution because their work has established more firmly the conservative treatment of eclampsia. I have always looked upon an eclamptic woman as a medical as much as an obstetric case and the problem of delivery in my belief is less important than that of her recovery. I am rather surprised at the comparatively large incidence of operative deliveries, five cesarean sections in a series of nineteen cases, especially since these patients presumably were studied carefully during the antepartum period. This rather high operative incidence does not seem to coincide with the other claims made for the more conservative treatment.

My own experience with magnesium sulphate has not been so satisfactory, in regard to sedative action as with morphine and scopolamine or atropine, and I therefore prefer morphine to magnesium sulphate for cases that show a tendency to convulsions.

A point that I do not believe has been sufficiently touched upon, is the condition of the patient after delivery. There seems to be a natural tendency, even where we tried to pursue conservative methods, to get these women delivered as rapidly as possible, although we may not resort to an operative delivery. The great danger for patients running high blood pressures is a sudden drop, which occurs within twenty-four hours after delivery and often results in death. The picture strikes me as one of vasomotor shock, in which there is an overfilling of the abdominal vessels. I question the advisability of giving these women large amounts of fluid intravenously. I think we get as good results from the concentrated glucose, say a 25 per cent solution, given in a dose of not over 250 c.c., and given very slowly, so that the administration of 250 c.c. may take from one to two hours, thus eliminating all shock to the circulatory system likely by the more rapid injection of large amounts of fluid. The diuretic effect of the glucose is equally as well marked. These patients do very well if on the third or fourth day they are given another intravenous infusion, particularly if they are irrational and it is difficult to give fluids by mouth.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—Dr. Dieckmann has to do not only with the laboratory work, but also is responsible for the treatment of the patient as soon as she enters the hospital. He observes the patient on admission, recommends the entire treatment and does the delivery on cesarean section, as the case may be. Although this series is still small, I think in time the combination de-

scribed by Dr. Dieckmann will prove most valuable in the treatment of late toxemias of pregnancy. Our clinical experience, however, covers considerably more than 31 cases. We have a large city hospital service with a large number of referred patients, almost all severe cases, and Dr. Dorsett has treated there over 120 cases with magnesium sulphate in the last four or five years. In the first part of the series of 60 odd cases, with six deaths, he used a considerable amount of magnesium sulphate, much higher than in the latter half of the series. In the latter half, he used 1000 c.c. of 10 per cent glucose solution, at least once, and sometimes more often. He was able in this series to appreciably reduce the use of magnesium sulphate. In Dr. Dorsett's later series, there were 54 cases with five deaths, three dying undelivered. The magnesium sulphate is given intramuscularly. Dr. Dorsett also induces labor with a bag in most cases. A blood dilution has been reported in late pregnancies and more particularly in eclampsia. We were rather surprised to find a marked blood concentration in cases of eclampsia with convulsions, and therefore report this finding with emphasis.

DR. JOHN C. HIRST, PHILADELPHIA, PA.—In the University of Pennsylvania Maternity Hospital I think we have had about 148 cases of eclampsia since 1920, and in that number one patient had one convulsion and died. Another had more than 100 convulsions and survived, so that I would like to emphasize the fact that the severity of eclampsia cannot be estimated by the convulsions alone.

DR. E. D. PLASS, IOWA CITY, IA.—Dr. Dieckmann's paper gives some very definite evidence with regard to the usefulness of hypertonic glucose solutions and indicates that the good effect which is produced is largely physical and certainly not specific. There is a relationship between the amount of clinical edema and the amount of blood dilution, which seems to indicate a balance between the circulating blood and the tissues. If it is possible in any way to disturb that balance by increasing the osmotic pressure inside of the circulatory system, we tend to produce a diuresis, and it is my opinion that the beneficial effects of hypertonic glucose solution are due to their hypertonicity rather than to the fact that they contain glucose, and that they act in a purely physical way by increasing the osmotic pressure, drawing the fluid out of the tissues and putting it in a position where it can be excreted by the kidneys.

DR. E. L. KING, NEW ORLEANS, LA.—The indiscriminate use of cesarean carries with it a high mortality. We collected at one time a series of 291 cesarean sections with a maternal mortality of 42 per cent in those performed for eclampsia. In Detroit it was practically the same in a series reported there. In Brooklyn it was 26 per cent. I would like to ask the criteria on which Dr. Dieckmann and Dr. Schwarz decide to do a cesarean in any given case, and at just what time of the treatment they employ the cesarean? Do the patients get the preliminary treatment first and thereby get in better condition? Just what points are employed in determining whether to do cesarean section or to resort to some other measure?

DR. FRED L. ADAIR, MINNEAPOLIS, MINN.—It is well known that in association with eclampsia there is frequently a cerebral edema. If this use of hypertonic solution intravenously changes the osmotic pressure it undoubtedly has a favorable effect on the edema by lessening the amount of tissue fluid in the central nervous system.

DR. WILLIAM J. DIECKMANN (closing).—Dr. Kosmak spoke of our high incidence of cesarean section, 5 cases. Only 2 of these 5 patients had had prenatal care, one as a private patient and the other at a municipal clinic. One

cesarean was performed on a mild case but she was a private and not a ward patient. We have had no difficulty in controlling the convulsions, probably through the dehydrating effect on the brain of the hypertonic glucose. Cerebral edema itself does not as a rule cause convulsions, but it does predispose to convulsions. At first we used small amounts of glucose but soon found that it required about 200 gm. to be effective. We are trying to find out just what the glucose does. We know that in many cases we get a marked and permanent blood dilution and that the coma disappears. We are undoubtedly changing the osmotic balance but do not know whether by forcing chlorides out, by changes in the permeability of the capillary walls, or by some other process. We consider the convulsions only as a symptom and because of our ability to control them do not attach much significance to them.

Dr. King spoke of our criteria for cesarean section. As outlined, we believe that our procedures will in a period of eight to twelve hours either make recovery assured or convince us that something else will have to be done. For example, if after the patient has been treated for this period, coma is developing or not clearing up, if a hyperpyrexia develops, or if the urinary output remains small, then we believe the case is not only severe in type but also that delivery should be completed as safely and quickly as possible.

Gonorrhea in the Female, by DR. LUCIUS E. BURCH, Nashville, Tenn.
(By invitation.) (For original article, see page 689.)

DISCUSSION

DR. ROLAND S. CRON, MILWAUKEE, WIS. (by invitation).—In reviewing my private records I found 17 sterility patients who had had neisserean involvement of the tubes and ovaries. In all of these the Rubin insufflation test was performed, but in only three instances was it possible to force carbon dioxide through either one or both tubes at a pressure between 160-180 mm. One of these patients later became pregnant. Complete healing of gonorrheal infection does occur, but scarring with closed tubes is the rule.

We have obtained most gratifying results by the use of the long nasal-tip cautery without splitting and resuturing the cervix. There are now available records of about 500 patients, cared for at the Milwaukee County Hospital under the supervision of Dr. Shutter and others, in whom a vast majority of cures have been obtained. Repeated cauterizations, sometimes carried well into the internal os, may be necessary.

Bartholin's and Skene's glands are frequently involved and, notwithstanding Dr. Burch's statement, they frequently call for eradication. The cauterization of Bartholin's ducts and glands is at times very unsatisfactory. In general, it is probably better to excise the gland, especially when it is one of the shot-like enlargements.

Skene's glands may be located laterally or in the base of the urethra and vary from approximately $\frac{1}{4}$ inch in length to over one inch. The glands of Morgagni or Littre may also become involved. Only in Graves' book Schuller's duct located in the top of the urethra is mentioned, and in this particular patient measured over one inch in length. Infection of all of these glands frequently calls for treatment, either irrigation with a blunt cannula syringe, sometimes cautery, but best of all incision or splitting.

DR. GUY L. HUNNER, BALTIMORE, MD.—Textbooks invariably speak of the great rarity of gonorrheal infection of the bladder. I suppose these statements are based largely on early experience with the male, in whom one cannot justifiably

investigate the bladder to find out whether he has a gonorrheal infection. In the female it can be done without damage. If a female has a urethritis during acute gonorrhea, she usually has cystitis as well. One can prove that by finding in a catheterized specimen the pus cells crowded with gonococci, or growing them on special media, or by discovering through the cystoscope the typical gonorrheal ulcers distributed over the surface of the bladder. In tuberculosis we often see a tiny linear, brilliant red ulcer which we have learned to interpret as suggestive of tuberculosis, but the elusive ulcer frequently duplicates this picture. In the acute gonorrheal bladder we usually find a fairly normal pale pink background, and on this are from one to a dozen or more areas characterized by a tiny red center to which radiate many congested vessels with almost the uniformity of the spokes of a wheel. With the constant irrigation which the urine affords, and the relatively weak resistance of the gonococcus, the picture soon disappears.

Our dealings with the gonorrheal bladder usually occur after the gonococcus has departed from the bladder, and possibly from the urethra, but has left those toxic effects on the nerve endings in the trigonum and urethra which result in a chronic state of trigonitis and urethritis, often difficult to diagnose from the identical cystoscopic picture caused by distant foci of infection. We might be helped in the diagnosis by the typical history in the gonorrheal case, or by the history of a distant focus of infection. The silver nitrate treatment usually acts like magic in the gonorrheal case, and yields little or no results in the focal infection case which is cleared up only after discovering and removing the distant focus.

Dr. Burch's method of treating endocervicitis seems too radical, but I agree with his conservatism in treating the intrapelvic gonorrheal conditions. We can get permanent results in most of the endocervicitis cases with the various cautery methods used in the office without general anesthesia.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—When Dr. Burch published his first paper, I did the operation as he originally described it, laying open the cervix with a cautery and then packing it with mercurochrome gauze. Frankly, I was disappointed with the operation, as I could accomplish the same ends by an easier method. The operation as he shows it today is a distinct improvement over the original one.

We have used practically all the methods which have been proposed at one time or another for the cure of gonorrhea. We followed very carefully the Corbus method in two hospitals and were not able to obtain a sufficient number of cures to continue the procedure. We have used all sorts of lights, diathermy and injections into the cervix, various antiseptics, vaccines and even intravenous injections of mercurochrome, and have come to the conclusion that the best way to eradicate gonorrhea from the cervix is by the proper use of the cautery.

Dr. Morrison, one of my assistants, following the work of Pelouze in gonorrhea of the prostate, has added massage to cauterization in the treatment of gonorrhea of the cervix. We believe that our results are better since we have been using this combined method.

DR. LUCIUS E. BURCH (closing).—I gave linear cauterization a thorough try-out before using the present method and discovered that I was unable to effect a cure.

Diathermy and topical applications to the endocervix were ineffective in my hands. If any of you will only once thoroughly dilate a cervix and then incise it and see the large amount of mucous membrane contained in the endocervix, you will quickly realize how futile linear cauterizations and topical applications are for relief of gonorrheal endocervicitis.

In effecting a cure the whole endocervix must be cauterized. I formerly advised the application of antiseptics to the endocervix following the incision of the

cervix. This is an unnecessary step with the present technic. The operation is not difficult and hospitalization is short unless large masses are present.

Dr. Hunner has presented some very valuable information concerning gonorrheal ulcers of the bladder, but even here the gonococcus does not survive after the ulcer has formed.

Dr. McGlinn brought out the difficulty of ascertaining when a case was cured. I believe one is safe in considering a patient well when negative smears are obtained after three successive monthly periods following the operation. Alcohol or whisky given orally bring gonococci to the surface but not so well as the monthly period.

The Pathologic Diagnosis of Early Uterine Cancer With Especial Reference to Its Differentiation From Pseudo-Malignant Inflammatory Lesions, by DR. EMIL NOVAK, Baltimore, Md. (For original article, see October issue, page 449.)

DISCUSSION

DR. GEORGE GRAY WARD, NEW YORK, N. Y.—Two things strike me as very important to be borne in mind from the clinician's standpoint. First, it is a complicated matter requiring great judgment and experience to make a correct diagnosis in many of the cases which are submitted for an opinion. We are seeing more and more of these early cases because the women are being educated as well as the doctors, and we not infrequently have to ask the pathologist for a diagnosis. Biopsy and curettage in the fundus cases we can do without much fear of dissemination of the disease. As to relying on frozen sections, my pathologist, Dr. Plaut, feels that this is not safe, and we are using paraffin sections which take a few hours, but yet not so long as the routine method. In doubtful cases we might put in the radium. We will get a report in a very few hours so that if the case is not malignant the radium can be removed after only a small dosage has been administered.

The importance of curing all diseased cervixes is very apparent if these cases are prone to go on to cancer. Dr. Novak justly emphasizes that we have been in the past entirely too prone simply to give the specimen to our pathologist and let his word be final. It seems to me that we should be just as particular in selecting the pathologist for consultation as we are in the selection of consultant in cases of questionable operation. We have had recently quite a few cases where there has been some question as to diagnosis, though the pathologist was fairly sure, and I have insisted that these specimens be taken to Dr. Ewing for another opinion. We should employ consultation with the pathologist more frequently than we do.

Within the past few weeks a woman came to me with a small cyst of the left ovary which was densely adherent and very painful. The patient was a young married woman in the twenties. Last summer a surgeon in New Brunswick had removed a right ovarian cyst. The pathologist made the diagnosis of sarcoma of the ovary and said the other ovary as well as the uterus must be taken out. Before doing anything I got the slides from New Brunswick and after they were passed upon by my pathologist and another pathologist in New York it was decided that there was absolutely no sarcoma, and we were able to save the other ovary.

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—I have spent a very material part of my medical life in the laboratory. Looking at this subject from the point of view of a laboratory worker, as well as that of a clinician, I would emphasize

most forcefully that laboratory study is merely a corollary to clinical work. The fundamental thing about a diagnosis of early cancer of the cervix is an adequate knowledge of gross pathology. With a good light over our shoulder we should bring down the cervix by "delivery of the uterus" so that we can see the cervix perfectly in doubtful instances, splitting the anterior lip for a better view of the endocervix when necessary. (I have very much less hesitancy about cutting into doubtful tissue than most of you.) The ideal thing, of course, is to take out all of the diseased portion of the cervix rather than remove only small pieces for study.

Let us not leave too much to the laboratory diagnosis. I believe thoroughly in a microscopic study; its value is irrefutable, but we must not place notable dependence upon modern refinements in histopathology.

As to cutting into cancerous tissue, I do fear it; but I think *the most important thing in the spread of cancer is the manipulation and the squeezing of the diseased tissues*. Such procedures in a doubtful case forces into the adjacent tissues a good deal more material than does one clean cut with the knife.

DR. WILLIAM P. GRAVES, BOSTON, MASS.—I cannot agree with Dr. Curtis in the matter of relying on gross inspection for the diagnosis of cancer of the cervix, and in order to illustrate the importance of biopsy to detect the disease, I will relate an experience which I have already reported.

We have always believed that the repair of a lacerated cervix is an effective though not a perfect preventive of a later cancer. In order to obtain some real information on this point, we made an investigation of all our cervical repair cases, amounting to nearly six thousand. When it was found that a patient had developed a cancer after a trachelorrhaphy, the specimen of tissue removed at the repair operation was subjected to a searching reexamination. In 3 cases it was discovered that the unsuspected cancer in an early stage had actually existed and had been overlooked by an experienced pathologist in his routine examination of the tissue removed. In all three cases the cancerous disease did not make itself known until three or four years after the repair operation.

No better evidence than this could be adduced to support Dr. Novak's insistence on the vital importance of searching expert biopsies in the diagnosis of cervical cancer.

DR. N. S. HEANEY, CHICAGO, ILL.—Does Dr. Novak recommend that a piece of the suspected area be taken out for examination? Is that what he means by a biopsy? If this is his recommendation, I disagree with it. If there is a visible lesion, the cervix should be amputated so as to include all the suspected area and an examination made after its removal. If it is cancerous, proper therapy can then be carried out, and the patient has not been jeopardized by having the area cut into. If it is not malignant, the patient is free of her lesion and relieved of her complaint. I think too many men turn the tissue over to a pathologist and abide by his decision so they never learn to correlate their clinical and pathologic experiences. This, of course, is not Doctor Novak's way of doing things, but it is true in too many places, and of necessity under such circumstances suspicious areas are diagnosed only on their microscopic appearance when most of them should have been diagnosed on their gross appearance.

DR. CAREY CULBERTSON, CHICAGO, ILL.—We should remember that Dr. Novak's remarks have been limited to that relatively small group of cases where the diagnosis is not evidently clear on gross inspection. I have not reached that point of visual accuracy where I am satisfied on looking at these small lesions of the cervix to say whether they are malignant or not. I am rather strong for biopsy, the excision of a piece of tissue and a speedy microscopic diagnosis of it. I have always followed my work into the laboratory. I had a very good lesson

in that some years ago at the county hospital in a case of evident incomplete abortion. The tissues went in the routine way to the laboratory, and the pathologist at that time was a relatively young and inexperienced man to be sure. He did not see any chorionic villi and sent back a diagnosis of malignant embryonic squamous carcinoma. Of course, he saw the embryonic epithelial cells. To leave the matter always to the pathologist is not by any means satisfactory. These cases of "atypical cellular proliferation," which is a nicer phrase to use than precancerous because it does not make the pathologist so angry, are precancerous I believe. I think that they represent a cellular proliferation, but sometimes they are very markedly obscured by round cell infiltration and are not as distinct as those Dr. Novak showed us today. And those are the ones, too, in which there is necessarily considerable doubt.

Dr. Novak referred to the propaganda. Cancer propaganda is aimed at the laity, and he intimated that it should as well be aimed at the general practitioner. That is without any question correct. I teach my students in the laboratory that it is up to the first doctor who sees the case to make the correct diagnosis, and for this the biopsy is essential.

DR. JOSEPH P. DELEE, CHICAGO, ILL.—May I ask Dr. Novak to tell us something about Hinselmann's work on the leucoplakia of the cervix, and what he thinks of it?

DR. HERMAN J. BOLDT, NEW YORK, N. Y.—I wish to emphasize most strongly the statement of Dr. Ward, that it is important occasionally to call the pathologist into consultation.

I have made it a rule to have every specimen examined and have seen three instances where a carcinoma was discovered that had not even been suspected. On two other occasions where competent men in our own city had made the diagnosis of carcinoma, but for clinical reasons I had some doubt about it, I sent the specimens to Dr. Welch of Baltimore. He returned a long report as to why the diagnosis of carcinoma was made but why it was not carcinoma.

DR. FRED L. ADAIR, MINNEAPOLIS, MINN.—A number of years ago I studied the healing process of cervical erosions. The squamous epithelium was seen invading the glands and undermining the surface and glandular epithelium, producing these very confusing pictures.

In the Middle West they have in many hospitals laboratory pathologists who are not particularly well trained in tissue diagnosis, and I know of serious mistakes which could have been avoided by consultation with an expert pathologist. We must keep in mind that not all doctors are experts in gynecologic diagnosis and for them a biopsy is probably the safest means of arriving at an accurate diagnosis.

DR. F. A. PEMBERTON, BOSTON, MASS.—Having seen many slides of different diseases of the cervix, we believe the gynecologic pathologist is in a better position to judge about these doubtful cases microscopically than the general pathologist, and Dr. Mallory agrees with us.

DR. EMIL NOVAK (closing).—Like Dr. Ward, I feel that the danger of disseminating cancer cells by biopsy upon the cervix is not very great. Furthermore, even if there were some danger, we would, when indicated, do it anyhow, for there is no other way yet available to settle the diagnosis in the doubtful case. The same statement can be made with regard to diagnostic curettage.

Dr. Curtis is inclined to minimize the frequency of cervical lesions in which a careful clinical examination does not suffice to establish the benign or malignant

nature of the condition. Perhaps, as with so many other questions, a compromise between the viewpoint of Dr. Curtis and myself may reflect most nearly the attitude of most gynecologists. While I agree that in the great majority of cases a careful clinical examination is all that is necessary, and that in such cases a biopsy is not necessary, nevertheless I am sure that in my own work I have seen a considerably larger number of exceptions than Dr. Curtis estimates from his own probably considerably larger material. In the ordinary cervical erosion, with smooth, nonvascular surface, biopsy is certainly not necessary. Nor is it necessary, except for confirmation purposes, to do biopsy in the frank cancer. The total number of cases in which biopsy is necessary, therefore, is not very large, the proportion being only a few per cent of all the cervical lesions observed.

Dr. Graves has mentioned a number of cases in which cancer was demonstrated microscopically, although there was apparently no clinical suspicion of malignancy. In our own laboratory I can recall at least 2 cases in which trachelorrhaphy was done by expert gynecologists for lesions later shown to be cancerous. In my paper I presented the results of follow-up studies made by a number of investigators, showing that the microscope will not infrequently belie the clinical impression, and that the subsequent course of the patient is in accord with the microscopic diagnosis. Our own results are in accordance with these general findings.

Cancer of the cervix is only rarely revealed by pathologic examination when there is no clinical suspicion whatever of cancer. But it is not infrequently found where the lesion clinically is only suspicious. Furthermore, and this is just as important, the microscope will often show complete absence of cancer in cases which clinically must be regarded as very suspicious.

Dr. DeLee inquires about the incidence of leucoplakia in the cervix. Hinselmann has recently written much about this lesion, but we have not been able to convince ourselves that it is at all common on the cervix if we understand by leucoplakia what the term conveys in relation to the vulva or to the tongue.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

The Interrelationship of the Anterior Hypophysis and the Ovaries

A REVIEW OF THE RECENT LITERATURE

BY C. F. FLUHMAN, M.D., C.M., SAN FRANCISCO, CALIF.

(From the Department of Obstetrics and Gynecology, Stanford University School of Medicine)

THE recent advances in our knowledge of the physiology of the anterior hypophysis and its relation to the female genital organs have served to open a field of investigation which is of the utmost importance to the gynecologist and the obstetrician. The purpose of this review is to consider some of the outstanding reports of experimental work dealing with the interrelationship of the anterior pituitary body and the ovaries, and with the preliminary attempts at a clinical application of these findings.

In order to classify the work that has been done on this very complicated problem, it may be advantageously considered under a number of headings. (1) Effects of hypophysectomy. (2) Effects of the administration of anterior hypophyseal extracts. (3) Effects of the transplantation of fresh anterior pituitary gland tissue. (4) Is there more than one anterior pituitary hormone? (5) The Zondek-Aschheim test for anterior pituitary hormone. (6) The anterior pituitary gland during pregnancy. (7) The anterior hypophysis following castration. (8) Relation to gynecologic disease and therapeutic possibilities.

EFFECTS OF HYPOPHYSECTOMY

The operation of hypophysectomy, which has been performed many times on experimental animals, chiefly dogs, is followed by profound alterations of the genital organs. As a result of total or partial removal of the anterior lobe of the hypophysis the most striking feature is a state of adiposity accompanied by (or resultant to) a secondary hypoplasia of the organs of generation in adults, or by a persistence of sexual infantilism in case the primary hypophyseal deficiency antedates adolescence (Crowe, Cushing and Homans¹; Aschner²; Smith³; Reichert⁴). The destruction of the pituitary gland by the injection of a chemical substance also results in marked disturbances in the reproductive system (Smith, Walker, and Graeser⁵).

EFFECTS OF ADMINISTRATION OF ANTERIOR HYPOPHYSEAL EXTRACTS

Previous to 1921 there had been many attempts to obtain a promotion of growth and the stimulation of the ovaries of laboratory animals with various preparations of the anterior pituitary lobe, and although one or two successful results were described, the evidence on the whole was not conclusive and many experimenters reported negative findings. Both fresh glands and extracts were employed and administered either by injections or by feeding to dogs, rats, or guinea pigs. Sandri,⁶ Aldrich,⁷ Lewis and Miller,⁸ R. T. Frank,⁹ Sisson and Broyles,¹⁰ Kross,¹¹ and C. S. Smith,¹² were unable to produce any effects on body growth and gonad activity, while Goetsch^{13, 14} and Marinus¹⁵ claimed to have obtained a stimulation of both these factors. Clark¹⁶ maintained that he was able to stimulate the ovaries in hens, as evidenced by increased egg laying, by feeding fresh anterior pituitary gland, but on the other hand this was denied by Pearl and Surface¹⁷ and Pearl¹⁸ who failed to corroborate the finding either by the injection or by feeding of a desiccated preparation. Both Evans and Long¹⁹ and Smith²⁰ have also reported negative results from feeding fresh gland tissue.

In 1921, Evans and Long^{21, 22} succeeded in producing very definite changes in the reproductive system of the white rat by the intraperitoneal injection of an alkaline preparation of bovine anterior hypophyseal substance. They found that estrus in these animals was absent or was exhibited at long intervals. The uterus remained infantile, but the ovaries were twice the size of those of the control animals. Histologic examination showed the presence of very abundant lutein tissue in the ovaries and the formation of this tissue about the egg in unruptured normal follicles and in atretic follicles. Ripe, normal graafian follicles were invariably absent. A powerful, specific stimulus to lutein cell transformation was thus effected by this hormone. These findings were confirmed by Brouha and Simonnet,²³ and Walker²⁴ was able to inhibit ovulation in the domestic fowl by the intraperitoneal administration of anterior hypophyseal substance. Teel,²⁵ Brouha,²⁶ and Evans and Simpson²⁷ were also able to bring about a decidual cell response to injury of the uterine mucous membrane (the "placentoma reaction") by the use of daily injections of similar extracts.

EFFECTS OF THE TRANSPLANTATION OF FRESH ANTERIOR PITUITARY GLAND TISSUE

Although a number of attempts were made to obtain results by the introduction of fresh living gland tissue by transplantation (Klinger,²⁸ Hofstätter,²⁹ Schäfer,³⁰ Clairmont and Ehrlich,³¹ Exner³²) negative findings were reported, until Smith^{3, 33} in 1926 used daily transplants of anterior lobe in an attempt to overcome the effects of hypophysectomy in the white rat. He found that not only was he able to restore an almost normal growth rate, but in addition there was a partial repair of the injury to the sex glands. Smith^{34, 35, 36} and Smith and Engle^{37, 38, 39} extended the study of anterior pituitary transplantations and succeeded in inducing a precocious sexual maturity in very young rats and mice. Transplants were made once or twice daily, and with striking rapidity the vaginal introitus became established and the vaginal smear revealed an estrual condition. At autopsy the sex organs of these animals showed a tremendous hypertrophy, the ovaries

gave evidence of ovulation, and ova were found in the fallopian tubes. The vaginal and uterine changes could not be obtained in spayed animals, and transplants from immature or senile, male or female animals, and from rats, mice, rabbits, guinea pigs, and cats were effective. It was thus shown that fresh anterior pituitary transplants act as a powerful stimulus to normal ovarian function, a finding in direct contradiction to the results obtained by Evans and Long with their alkaline extract.

Zondek and Aschheim,^{40, 41, 42} working independently of, and simultaneously with, the above authors, also succeeded in producing precocious sexual maturity in young mice by similar transplantations of anterior pituitary tissue. They found that the glands obtained from immature, mature, or senile animals were effective, as were those from human subjects and from cattle. These workers assert that the anterior pituitary body is the active *motor* agent that stimulates the ovary to activity, and that the resultant changes in the uterus and vagina are due to the effect of the ovarian follicular hormone thus produced.

This outstanding work of Smith and Engle, and Zondek and Aschheim has received abundant confirmation from numerous sources, for example, Fels,⁴³ Biedl,⁴⁴ Ehrhardt,⁴⁵ Siegmund,⁴⁶ Lipschutz and Paez.⁴⁷ In addition, a number of experimenters have used different species of animals as recipients of the transplants with equal success. Allen⁴⁸ was able to induce precocious sexual maturity in monkeys, Reiss and Langendorf⁴⁹ in dogs and rabbits, Riddle and Fleming⁵⁰ in ring doves, and Wolf⁵¹ produced ovulation in frogs. Grueter⁵² used an aqueous extract of the anterior pituitary gland and also obtained an ovarian response in rabbits. Engle⁵³ has shown that the anterior pituitary gland is an important factor in the compensatory hypertrophy of the ovary which occurs after unilateral or subtotal ovariectomy, and also that grafted ovaries respond to transplants.⁵⁴ Reichert¹ was able to overcome in a large measure the disabilities arising from hypophysectomy in a six weeks' old female puppy by four months of replacement therapy with daily fresh heterotransplants of rabbit pituitary gland. During this whole period external signs of estrus were present in this puppy although the littermate control did not come into heat until much later. The gonad-stimulating hormone has been found in the anterior pituitary gland of senile human beings (Schultze-Rhonhof and Niedenthal⁵⁵), and of the human fetus (Siegmund and Mahnert,⁵⁶ and Schultze-Rhonhof and Niedenthal⁵⁷), although Hauptstein⁵⁸ failed to corroborate the latter result.

In the light of this work there has been very little contradictory evidence brought forward. Fellner⁵⁹ does not believe that the ovarian response in immature animals is due to a specific hormone from the anterior lobe and states that he obtained the same result with an ovarian hormone preparation ("Feminin"). This is, however, altogether against the experience of many workers who have failed to find any changes in the ovaries following the injection of ovarian follicular hormone. Fels,⁴³ Siegmund,⁴⁶ and Mahnert⁶⁰ claim that the corpora lutea resulting in the ovaries are not true physiologic structures but abnormal formations such as described by Evans and Long and that normal ovulation thus does not take place. In this regard attention must be directed to the finding of ova in the fallopian tubes of the test animals by Smith and Engle and Zondek and Aschheim.

Some doubt has been advanced as to whether a true precocious maturity is really induced in these immature animals (Siegmund,⁴⁶ L. Seitz⁶¹) and Seitz suggests that we should consider it as a morphologic change rather than a true functional result. He quotes Ehrhardt as having placed a number of these artificially matured young mice with males and pregnancies did not occur any sooner than in the untreated controls. He thus feels that the assumption that the anterior pituitary gland is the activator of sexual function must be accepted with limitations.

IS THERE MORE THAN ONE ANTERIOR PITUITARY HORMONE?

It is thus seen that a number of seemingly contradictory effects have been induced in the ovaries of immature mice by the administration of various substances considered as originating from the anterior hypophysis. In the first place, we find the stimulation of normal ovulation with a hastening in the appearance of estrus such as obtained from the implantation of the fresh living gland; and second, an abnormal process in which there is an extensive luteinization of follicles and an inhibition of estrus, such as results from the alkaline extract of Evans and Long.

Evans and Simpson⁶² have advanced a theory, based on experimental evidence, which seeks to explain these changes by attributing two hormones to the anterior hypophysis. There is first a "growth hormone," which is closely related to the eosinophilic cells of the pars anterior, and a "gonad-stimulating hormone" corresponding to the basophilic cells. These two substances are antagonistic to one another and the effects of the second on the sexual system can be completely nullified by simultaneous administration of the first. The anterior pituitary extract which Evans and Long used in their original experiments thus contained large amounts of the growth hormone which delayed the onset of puberty by the formation of extensive luteinization of follicles, while the implantations of the fresh gland yield mostly the gonad-stimulating hormone and produce normal ovulation.

Bellerby⁶³ also believes that there are two anterior pituitary hormones which affect the pelvic organs, namely, an "estrus-producing" and an "estrus-inhibiting" hormone, while Aschheim⁶⁴ goes still further and attributes three hormones to the anterior hypophysis—first, the growth hormone, second, the luteinization hormone, and third the ovulation hormone.

ZONDEK-ASCHHEIM TEST FOR ANTERIOR PITUITARY HORMONE

On the basis of the results obtained from implantations of the anterior pituitary gland, Aschheim and Zondek^{65, 66} have evolved a test for the hormone which promises to be of considerable clinical importance. The substance to be examined is injected into an immature mouse and in a positive test evidence of estrus (vaginal smear; hypertrophy of the uterus) is observed in about 100 hours from the time of the first injection. The animal is then sacrificed and serial sections of the ovaries are carefully examined for one or more of the following changes:

APR I. (Anterior Pituitary Reaction One)—The presence of ripening graafian follicles or of recent corpora lutea.

APR II. The finding of "Blutpunkte," small reddish pinpoints grossly visible in the ovaries and representing hemorrhages into normal and abnormal follicles.

APR III. The occurrence of lutein cell transformations in follicles and the formation of corpora lutea in which ovulation has not occurred and the ovum remains imprisoned (pseudocorpora lutea; corpora lutea atretica).

The finding of any one of these changes is considered as positive for anterior pituitary substance, but it is of interest to note that the first reaction compares to that resulting from the implantation of fresh anterior pituitary gland, whereas the third reaction was obtained by Evans and Long with their alkaline extract of bovine gland. The differentiation between the hormone of the anterior hypophysis and the ovarian follicular hormone is readily made since the former produces ovarian changes but does not act in spayed animals, while the latter never affects the ovaries and its injection in castrates causes vaginal changes corresponding to estrus (Allen-Doisy test).

Kraus⁶⁷ has described an improvement in the technic of the test which allows the examination of the mice ovaries without resorting to microscopic sections.

The test has been used mainly, and with success, as a means of diagnosing early pregnancy from the examination of patients' urine, but for this purpose Zondek and Aschheim insist that either reaction II or III must be present. With this means they examined 197 specimens of urine from 161 women with normal pregnancies, 68 of whom were in the first eight weeks of gestation, and obtained positive results 193 times. The control series included various gynecologic conditions and yielded 254 negative results out of 258 specimens of urine. Similar success has been reported by Louria and Rosenzweig,⁶⁸ Ehrhardt,⁶⁹ Wermbter and Schultze,⁷⁰ Brühl,⁷¹ and Kraul and Rippel.⁷²

In addition, Aschheim and Zondek^{73, 74} have shown the presence of anterior pituitary hormone in the decidua graviditatis of the first four months, in the corpus luteum graviditatis, in the placenta and in maternal blood after the second month of gestation, in blood from the umbilical cord, and in the tubal mucosa of both intra- and extrauterine gestations of two months' duration. Fels⁴³ found anterior pituitary hormone in the blood serum of thirty out of thirty-eight pregnant patients. Fluhmann⁷⁵ obtained APR I 8 times and APR II or III 27 times with the blood serum of forty-eight women with uncomplicated pregnancies. Although the hormone is not present in the spinal fluid during normal pregnancy, positive results have been obtained in eclampsia (Ehrhardt quoted by Seitz⁶¹).

Although it is claimed to be of no value for the diagnosis of pregnancy, the presence of APR I may eventually prove of clinical assistance in the study of certain functional disturbances. Zondek and Aschheim⁶⁶ found it in the urine of one normal woman, in one case of acromegaly, in two cases of myxedema, in one case of hyperthyroidism, in two cases of severe pelvic inflammation, in one case of amenorrhea associated with a papillary cystadenoma, in three cases of functional amenorrhea, and in seven cases of genital carcinoma. Ehrhardt (L. Seitz⁶¹) also found it in the urine of women with amenorrhea, in certain cases of endocrine disturbances, and following bilateral oophorec-

tomy. Fluhmann⁷⁶ obtained positive results from the blood serum of patients following bilateral oophorectomy or radiation castration, and in several women with functional amenorrhea or irregular menstruation.

THE ANTERIOR HYPOPHYSIS DURING PREGNANCY

In 1898, Comte⁷⁷ described a gross enlargement of the anterior lobe of the pituitary gland during pregnancy, and further observations were reported some years later by Launois and Mulon⁷⁸ and Launois.⁷⁹ It remained for Erdheim and Stumme⁸⁰ to show that this hypertrophy is accompanied by definite histologic changes; namely, a marked increase in the number of "Hauptzellen." This finding in the human being has been corroborated by a number of other observers (Kolde,⁸¹ Creutzfeld,⁸² Mayer,⁸³ Naegeli⁸⁴), and studies extended to animals have shown similar changes (Guerrini,⁸⁵ Morandi,⁸⁶ Naegeli,⁸⁴ Kolde,⁸¹ Berblinger,⁸⁷ Schenk,⁸⁸ Lehmann⁸⁹).

The occurrence of a pituitary hypertrophy during pregnancy offers an interesting physiologic problem, and although its exact significance is not appreciated, it is possibly a direct effect of ovarian follicular hormone, which is present in large amounts in the blood during the course of gestation. The "pregnancy changes" of the anterior hypophysis were produced in nonpregnant, castrated and noncastrated female animals by the injection of placental extracts by Berblinger,⁸⁷ Adaichi,⁹⁰ and Lehmann,⁸⁹ by parabiosis experiments with pregnant and nonpregnant rats by Matsuyama,⁹¹ and recently by the direct administration of ovarian hormone by Baniecki.⁹²

In this connection the effect of transplantations of anterior pituitary gland tissue into pregnant rats and mice is of importance. It has been found that although these treatments invariably produce an abortion (Ehrhardt and Wiesbader⁹³) especially if given during the first two-thirds of the period of gestation, ovulation may be induced in spite of the fact that the animal is pregnant (Zondek and Aschheim,⁹⁴ Engle and Mermod,⁹⁵ Fels⁹⁶). Siegmund,^{46, 97} however, states that he failed to produce changes either in the vaginal epithelium or in the sex glands by implants of anterior pituitary lobe in pregnant mice. Teel,⁹⁸ by the administration of an anterior hypophyseal extract, was able to lengthen the gestation period of rats from two to six days, although he found that term fetuses invariably died in utero. Evans and Simpson⁹⁹ believe that the interference with pregnancy is due to the extensive formation of lutein tissue in the ovary.

THE ANTERIOR HYPOPHYSIS FOLLOWING CASTRATION

The hypertrophy of the anterior hypophysis following total extirpation of the ovaries was first found in animals by Fichera¹⁰⁰ in 1904, and it has since been corroborated by Zacherl,¹⁰¹ Schleidt,¹⁰² Trautmann,¹⁰³ Kolde,⁸¹ Schönberg and Sagakuchi,¹⁰⁴ van Wagenen,¹⁰⁵ Lehmann,¹⁰⁶ Berblinger,⁸⁷ Livingston,¹⁰⁷ Schenk,¹⁰⁸ and others. In 1908, Tandler and Gross¹⁰⁹ demonstrated an enlargement of the sella turcica of eunuchs by means of x-ray studies, and Kon,¹¹⁰ Kolde,⁸¹ and Rösse¹¹¹ have shown that castration in the human being results in a gross hypertrophy of the anterior hypophysis which histologically is due to an increase in eosinophilic cells and the appearance of a much-debated type of cell, the "castration cell." It is probable that these changes are accompanied by a progressive storage of the

hormone in the gland (Evans and Simpson¹¹²) and this is further borne out by the fact that the use of anterior pituitary gland implants from castrated rats provokes reactions in the ovaries of the test animals many times greater than similar implantations of normal hypophyseal tissue (Engle,¹¹³ Evans and Simpson¹¹⁴). It is also of interest to note that following total extirpation of the ovaries in women there is a large amount of anterior pituitary hormone in the blood which is readily demonstrable by the Zondek-Aschheim test (Fluhmann⁷⁶).

RELATION TO GYNECOLOGIC DISEASES AND THERAPEUTIC POSSIBILITIES

The successful clinical application of anterior pituitary therapy in gynecology is dependent on a number of factors: (1) A proper understanding of the exact relation of the anterior hypophysis to the pelvic organs of the human being in both health and disease; (2) the development of an active, standardized, economical preparation of the gland which is easy of administration; (3) an exact knowledge of its action on the female sex organs under physiologic conditions; (4) the determination of the correct indications for its use in pathologic states; and (5) the estimation of the proper dosage.

Although there is little known regarding the rôle of the anterior pituitary gland in the common pelvic diseases which gynecologists are called upon to treat, it is well recognized that a depression of sexual function is a symptom common to both the hypopituitary and acromegalic syndromes. Dott and Bailey¹¹⁵ found a marked constancy of amenorrhea as the earliest evidence of a hypopituitary condition, and noted its presence in numerous instances of hypopituitary function. This fact may explain the presence of large amounts of the hormone in the blood or urine of certain amenorrheic patients (Zondek and Aschheim,⁶⁶ Ehrhardt,⁶¹ Fluhmann⁷⁶). The occurrence of a "pituitary" type of menstrual disturbance (amenorrhea, scanty or irregular menses, dysmenorrhea), accompanied by such features as adiposity, skeletal changes, and hypoplasia of the genital organs, has also been described (Fraenkel and Geller,¹¹⁶ Klatfen¹¹⁷). There is very little information available regarding ovarian pathology in acromegalic patients, but in one case Cushing and Davidoff¹¹⁸ report that they were unable to find lutein cell formations such as have been observed in experimental animals. They noted, however, a striking absence of corpora atretica although the ovary contained fully developed graafian follicles. Wagner¹¹⁹ found luteinized cysts in the ovaries of a patient with a hypophyseal tumor who had had a period of four months' amenorrhea. Aschheim¹²⁰ has drawn attention to the lutein cysts in the ovaries of patients with hydatidiform mole and chorioepithelioma malignum, and thinks the anterior hypophysis may prove to be an important factor in such cases. In one instance he found large amounts of anterior pituitary substance in the blood and urine.

A number of reports have been published regarding attempts to obtain a preparation of the anterior pituitary hormone for clinical use. Zondek,^{121, 122, 123} Biedl,¹²⁴ and Siebke,¹²⁵ have obtained an active substance from the urine of pregnant patients. Putnam, Teel and Benedict,¹²⁶ and R  th, Hirsch-Hoffman and Walk¹²⁷ have prepared potent extracts from the gland itself. Ehrhardt and Wiesbader¹²⁸ have used subcutaneous implantations of bovine anterior hypophysis.

The effects in the human being of such preparations are not as yet

clearly understood, but a number of important observations have been recorded (Zondek,^{121, 122, 123} Ehrhardt and Wiesbader,¹²⁶ Ehrhardt,¹²⁹ Biedl,¹²⁴ Hirsch-Hoffman¹³⁰). The most outstanding results reported are: a tremendous congestion of the pelvic organs; an increase of the temperature of the vagina and rectum; a shortening of the menstrual cycle and a hastening of ovulation. Uterine bleeding has resulted in certain cases of prolonged amenorrhea, but as it has been pointed out, it does not necessarily follow that this represents a true menstruation, and it may well be a metrorrhagia consequent upon the intense pelvic congestion. Ehrhardt and Wiesbader, however, found a premenstrual swelling of the mucosa in a patient with dystrophia adiposo-genitalis who had had a previous period of six months' amenorrhea, and Zondek has made similar observations in other instances. Kaufmann¹³¹ has found an increase of blood cholesterol after the administration of Zondek's preparation.

R. Schroeder (Siebke¹³²) has stated two clinical tests for the determination of the effect of such a hormone in patients and particularly in cases of amenorrhea of long standing; first, the stimulation of the uterus, as evidenced by its enlargement, turgor, etc., and second, the so-called "tempo-test," which is positive when as a result of hormone treatment, follicle ripening, ovulation, and corpus luteum formation (also evidenced by the changes in the endometrium) occur in proper sequence. Siebke¹³² is treating, with some success, four main groups of patients, (a) those with too frequent menstrual bleeding, (b) with prolonged menstrual cycle, (c) with absence of menstruation, and (d) with hypoplastic genitalia accompanied by dysmenorrhea.

The importance of x-ray applications over the region of the pituitary gland in the treatment of gynecologic disorders must also be mentioned. In 1921, L. Fraenkel¹¹⁶ pointed out that this type of therapy could be used not only in the case of hypophyseal tumors but in patients with dysfunction of the gland as shown by disturbances in the genital organs. Geller¹¹⁶ described an atrophy of the pelvic organs of the rabbit five months after irradiation of its head. In 1922, Hofbauer¹³³ recommended irradiation of the hypophyseal area for elimaeterie bleeding and hemorrhage due to fibromyomata. He later showed¹³⁴ that with small x-ray doses menstruation may be produced in certain amenorrheic patients, whereas larger doses in women with normal periods may result in a cessation of the menses. The problem has been taken up by a number of workers (Hirsch,¹³⁵ Werner,^{136, 137} Borak,¹³⁸ Drips and Ford,¹³⁹ and others) and is now a recognized means of therapy in the treatment of functional amenorrhea, dysmenorrhea, certain forms of abnormal bleeding, etc.

CONCLUSIONS

It is thus seen that the existence of a definite relationship between the anterior pituitary gland and the female pelvic organs has been established. Hypophysectomy results in an atrophy of the genitalia; the administration of an extract of the anterior hypophysis produces profound changes in the ovary; the transplantation of the fresh gland stimulates the immature ovary to activity; during pregnancy and following castration there is a gross hypertrophy of the anterior lobe and an increase in the amount of the hormone in the blood and urine of the patient. A simple test for the anterior pituitary hormone, which is of

value in the diagnosis of early pregnancy, has been developed. Preliminary reports lead one to believe that an active therapeutic preparation will in time be available and the indications for its use understood. Irradiation of the hypophyseal area for certain pelvic disorders has yielded satisfactory results.

Undoubtedly a great deal yet remains obscure, but the tremendous advances of the past few years lead one to anticipate a new era in our conception of the physiology and pathology of menstruation and of the interrelationship of certain endocrine glands.

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Selected Abstracts

Pregnancy and Disease

Robinson: The Effect of Parturition on the Heart. *Lancet* 212: 170, 1927.

The effect of the pathologic processes, whether they be muscular, valvular, or rhythmic, is to reduce the efficiency of the heart by limiting the capacity of its reserve force. If the disease is progressive or the demand for work excessive, the reserve force is so reduced that the heart may be unable to meet the demands made upon it.

A pregnant woman with auricular fibrillation has the cardiac reserve forces depleted by the following factors: the valvular lesion, the altered rhythm, the strain of pregnancy and labor, and frequently the toxemic states in which degenerative changes are commonly found in the musculature and blood vessels.

The effect of parturition upon the normal heart is to displace it upward, with pressure on the right ventricle. The circulatory changes include plethora. The normal heart meets these demands by calling upon its reserve forces. In labor the efforts are simply those of muscular effort which always imposes a strain upon the heart and calls on the reserve. During the puerperium an additional amount of blood in the maternal circulation is present due to the contractions of the puerperal uterus which empties and occludes the vessels of the placental site.

The effect of parturition on the abnormal heart must depend upon the amount of reserve force left in the damaged organ. If this reserve is considerable, the strain may be easily overcome. If it is small the outlook is serious. If there is complete absence of reserve force or heart failure the outlook is always highly dangerous. This is supported by the fact that of the 18 patients with auricular fibrillation, which the author reports, 13 died either before, during, or soon after delivery.

The treatment of heart disease in pregnancy is summarized as follows: (1) A woman with serious depletion of the cardiac reserve forces should not become pregnant. (2) If conception occurs in the presence of seriously depleted reserves the pregnancy should be terminated before the onset of heart failure. (3) The induction of labor in the presence of heart failure is unjustifiable. (4) Artificial termination of pregnancy should be carried out when cardiac compensation has been reestablished and for many cases cesarean section is the best method of delivery.

NORMAN F. MILLER.

Oliver, Sir Thomas: Heart Disease and Pregnancy. *British M. J.* 1: 709, 1927.

The consensus of opinion is that in pregnancy there is a slight increase in the size and weight of the heart. Experiments on female dogs show that the cardiac output is increased by one-third to one-half during the later months of pregnancy. Since during the whole period of gestation there is never a fall of the arterial blood pressure, the heart is really called upon to perform a greater amount of work. Opinions differ as to whether this is accomplished by the heart becoming hypertrophied or simply by the organ calling upon its latent reserve.

Apart from myocardial failure, mitral stenosis is the cardiac lesion which gives rise to the greatest danger in pregnancy, both during and after parturition. While a cardiac patient may pass successfully through two or three pregnancies and be little worse, yet with each succeeding pregnancy the heart becomes less able to bear the strain. It dilates, and its musculature becomes less efficient. There is always a tendency toward pulmonary congestion.

With regard to the marriage of a woman with heart disease, the author considers the condition of the heart, the presence or absence of dilatation, the regularity and rapidity of the beat, the history of hemoptysis and dyspnea, as well as the social and economic status of the patient. Life is threatened mainly by changes in the myocardium and in these are included the sinoauricular node, the auriculoventricular node, and the bundle of His. The irregularities include fibrillation, extrasystoles, tachycardia, and heart-block.

If there are no symptoms the treatment consists in observation, diet, regulation of exercise, and elimination. Rest and digitalis constitute the treatment with symptoms present. If signs of fatigue or failure appear, the application of forceps is indicated in the second stage of labor. If dyspnea arises during labor, oxygen may be administered, also stimulants, such as, strychnine, etc.

ADAIR AND GRIMES.

Jensen, Fr. G.: Investigations on the Influence of Pregnancy and Parturition Upon Organic Cardiac Disease. Acta obst. et gynec. Scandinav. 6: 239, 1927.

The conclusions of Jensen's study are as follows:

Functional heart disease and mild cases of pregnancy toxemia are of more frequent occurrence in pregnant women who previously had rheumatic fever than in those who had previously been perfectly healthy. The character and intensity of the murmurs over the cardiac region always undergo changes in the course of pregnancy and parturition. Therefore, by means of stethoscopic examination alone it is not possible to determine whether a cardiac patient can endure the strain of pregnancy and parturition.

Pregnancy and parturition in cardiac patients are often complicated by a recurrent, toxic, endocarditis, and initial cardiac insufficiency, which symptoms, however, never set in suddenly.

In patients with mitral stenosis the power of accommodation of the myocardium, and not the narrowness of the stenosis, determines whether the patient can endure pregnancy and parturition. Therefore, one must always test the patient's response to acute exertion, simultaneously determining her blood pressure and pulse rate.

Independently of the patient's age, recurrent, toxic endocarditis occurs especially in patients with recently acquired heart disease. Endocarditis and cardiac insufficiency are indications for the interruption of pregnancy, if they do not readily yield to treatment.

Patients with heart disease are exposed to circulatory disturbances, particularly during the last four to six weeks of pregnancy. Therefore, artificial premature delivery should more frequently be resorted to than hitherto. The follow-up examination of 62 out of 119 cardiac patients showed that the prognosis of heart disease during pregnancy depends upon regular examinations of the patients from the commencement of pregnancy, and upon intensive treatment after the occurrence of the first symptoms of circulatory disturbances.

J. P. GREENHILL.

Hay, John, and Hunt, Elizabeth: A Record of Fifty Consecutive Cases of Pregnancy and Parturition in Patients with Crippled Hearts. Lancet 224: 271, 1928.

An added strain in pregnancy occurs with the increased weight, the enlargement of the uterus and breasts, and the dilated vessels; and in the last third of pregnancy, with interference of the diaphragm, displacement of the heart, and chest changes. The effects are more noticeable in primigravidae, and the discomforts and difficulties increase with the advance of pregnancy.

The first stage of labor does not put a severe strain on the heart, even with exhaustion, but the second stage is the important phase. Because of the drop in the blood pressure, the patient may collapse or may have a severe hemorrhage immediately after delivery.

With auricular fibrillation the author does not induce labor until specific treatment with digitalis has failed. Generally, induction of labor is advisable over cesarean section in any of the cardiac complications.

Rest and sedatives are valuable in the first stage, and instrumental help early in the second stage. During pregnancy rest with "specific treatment" is recommended.

The writer is not strictly opposed to pregnancies in cardiac patients, although there is an increased danger to the mother. The heart usually responds very well to treatment during gestation.

H. C. HESSELTINE.

Sachs, E.: Management of Labor in the Patient with Cardiac Disease. Deutsche med. Wchnschr. 54: 45, 1928.

The most important problem is the treatment of the diseased heart. Interruption of pregnancy is the last thing to be considered, even in early pregnancies. If rest and proper medication does not restore the disturbed compensation then termination of pregnancy certainly will not prove beneficial.

The situation is different in advanced pregnancy because there are mechanical conditions and special demands on heart action, etc., which might add to the existing difficulties, but even under these conditions the restoration of compensation is the prime task of all therapy.

The value of proper psychic influence should not be undervalued. The patient must be assured that her physician will be with her during labor, that all unnecessary pain and physical effort will be avoided as far as possible.

Inability to combat decompensation and extracardial complications (nephritis) render prognosis bad. It is necessary to avoid all sudden fluctuations in blood pressure, incident to emotions, bearing down efforts, escape of blood into abdominal viscera after expulsion of the fetus, etc.

Earlier in labor, the quinine—ether—oil enema works satisfactorily, later to be supplanted with twilight. The labor is terminated quicker by use of a pituitary preparation, forceps, or extraction in breech presentation. Prompt administration of ergot and application of a heavy sandbag on the abdomen, immediately after expulsion of baby, prevents sudden fall in blood pressure and "empty pumping" of heart as result of large quantities of blood passing into the visceral blood vessels. Puerperium itself, if normal, holds no further dangers. These patients always should be managed in hospitals.

Cesarean section the writer reserves only for cases with added complications such as narrow pelvis, placenta previa or prolapsed cord because in the cesarean operation the sudden fall in blood pressure can be combated solely with ergot. The operation is preferably done under lumbar anesthesia, but it is his belief, that delivery through the vagina is safer than cesarean for all cardiac patients.

GRUENFELD.

Zinsstag, G.: Pregnancy and Mitral Stenosis. Monatsschr. f. Geburtsh. u. Gynäk. 75: 498, 1927.

The author reports three fatal cases of mitral stenosis which occurred in pregnant women. He is convinced that contrary to some opinions, mitral stenosis can be a very serious complication in pregnancy. In these cases, signs of decompensation which are usually present with other forms of heart trouble, are frequently

entirely absent. In many instances death occurs suddenly in an apparently healthy woman. Statistics are of very little significance. In the Aarau and also in the Basle clinics, all the fatal cases of heart disease during pregnancy were in women who had mitral stenosis. The author believes that pregnancy should be interrupted in cases of mitral stenosis regardless of whether or not signs of decompensation are present. Exceptions may be made in primiparas but there is danger in them also. Cesarean section under local anesthesia is a very commendable form of delivery and should be used frequently. Sterilization should always be performed.

J. P. GREENHILL.

von Jaschke: Pregnancy and Mitralstenosis. *Zentralbl. f. Gynäk.* 51: 1350, 1927.

Contrary to the opinion of many German obstetricians, von Jaschke does not approve of interruption of pregnancy, when complicated by a well compensated mitral stenosis. This lesion is likely to become decompensated but only then abortion is to be performed. Lumbar anesthesia is preferable to any form of inhalation anesthesia. Cases, reported by others to have taken a disastrous course during or after pregnancy, were all complicated by pericarditis, myocarditis, etc.

GROVER LIESE.

Mahon, R.: Hereditary Tuberculosis. *Rev. franç. de gynéc. et d'obst.* 22: 193, 1927.

Modern literature seems to show that hereditary tuberculosis does not exist. Undoubtedly a woman with advanced tuberculosis often gives birth to a nonviable fetus. However in these instances the tuberculosis acts like any general illness which causes premature labor but it is not a specific action. There are two aspects in the heredity of defective ova. The first is the transplacental contamination with the tubercle bacillus but this is rare. The second is the transplacental transmission with the filterable form of the tuberculous virus but this is still rarer than the first. Clinical research has definitely shown that the very large majority of children born of tuberculous parents remain well and grow up healthy. If infants cannot be protected against tuberculous infection they should be immunized by the injection of Calmette and Guérin's vaccine.

J. P. GREENHILL.

Hill, Allis M.: A Statistical Study of the relationship Between Pregnancy and Tuberculosis. *Am. Rev. Tuberc.* 17: 113, 1928.

This study includes 349 women whose pregnancies occurred during, or immediately preceded, pulmonary disease, and of 160 women as controls who had been pregnant but whose condition was not tuberculous. Comparison of these two groups leads the author to conclude that pregnancy had no appreciable bearing upon the progress of the pulmonary condition. The earlier the diagnosis was made the less hazardous were their pregnancies. The highest mortality occurred among primiparae. Primiparae constituted 15 per cent of the women diagnosed before pregnancy, 21 per cent during and 32 per cent after confinement. The maternal mortality for tuberculous women corresponded to the mortality rate among registered females of the same ages. As to sanatorium treatment, only one-third of the 349 patients had as much as six weeks of institutional care, and many more were hospitalized after delivery than diagnosed before or during pregnancy.

In an attempt to obtain more data concerning the relationship of tuberculosis to pregnancy, the author urges the use of a uniform scheme or history which should be sent, properly filled out, to the National Tuberculosis Association at the close of the case.

SIGOLOFF.

Bridgman, E. W.: Pulmonary Tuberculosis and Pregnancy. Bull. Johns Hopkins Hosp. 38: 83, 1926.

This study is based on 14,000 records of indoor obstetric cases admitted to the Johns Hopkins Hospital. Of these, 134 had evidence of pulmonary tuberculosis in some form. There was about an equal number of whites and blacks, with a large percentage of multiparae. The 134 patients were grouped as follows: (1) questionable tuberculosis; (2) definite but inactive pulmonary tuberculosis; (3) definite active tuberculosis of the lungs upon whom therapeutic abortion was not performed; (4) definite tuberculosis of the lungs upon whom therapeutic abortion was induced, and (5) pulmonary tuberculosis associated with other diseases.

Where there is a far advanced or an acute, rapidly spreading tuberculosis, pregnancy serves as the final straw and practically assures a lethal outcome. The author feels that pregnancy should be avoided in the presence of an active tuberculosis as in the series it proved disastrous. Operative treatment, however, in the presence of an active tuberculosis is followed by a higher mortality rate than the expectant treatment. Artificial termination of pregnancy is not indicated in a pregnant woman with an active tuberculosis. Treat the tuberculosis to the uttermost, but disregard the pregnancy. The tuberculous mother should not be subjected to repeated pregnancies. Tubal sterilization should be resorted to in appropriate cases after consultation between obstetrician and practitioner. Lactation should be avoided or limited because of the harmful effect on the mother and danger of infecting the baby. Statistics from their own cases and from those of others indicate that 50 per cent of the infants born to mothers with an active tuberculosis die within the first year of their lives.

ADAIR.

Jeannin, M.: Concerning the Influence of Pregnancy on Pulmonary Tuberculosis. Le Progrès méd. No. 28, 1083, 1927.

Pregnancy is incapable of exercising a favorable influence upon the focus, even granted that occasionally the condition of the lesions remains stationary, as might be the case in the sclerous and extremely resistant forms. Pregnancy in the great majority of cases seriously aggravates the tuberculosis, especially where the infection makes its appearance during a pregnancy. The worst effect seems to be in the early months, the latter months, and especially immediately after delivery. A very harmful rôle can be assigned to repeated pregnancies, especially if coming close together. The wide extension of the infection during pregnancy, and also frequent involvement of the larynx, is pointed out. Lactation, toxemic vomiting, etc., all exert a harmful effect. The proved fact of generalized lowered resistance during pregnancy is given as an additional explanation of its unfavorable effect on the tuberculosis.

Medical treatment should be scrupulous. Artificial pneumothorax may be advisable. From the obstetric standpoint interruption of the pregnancy is essential but should not be done after the third or at most the fourth month. The results of interruption of pregnancy appear to the author very good. Either a curettage or hysterectomy should be performed, the latter being the operation of choice, where the question of sterilizing the patient arises.

SCHAUFFLER.

Goldschmidt, H.: The Fate of Women After Postponed Interruption of Pregnancy. Med. Klin. 24: 1003, 1928.

The author followed up 14 patients who had serious medical ailments during pregnancy but for which the pregnancy was not interrupted. Eight patients had pulmonary tuberculosis, three had cardiac decompensation, one had bronchial asthma

and two had general asthenia. Not one of the eight tuberculous patients died but all lost weight after delivery. Two patients had to continue treatment for their pulmonary condition. Seven of the patients went to full term and one had an abortion. All the deliveries were uncomplicated. Of the eight babies (one pair of twins), two died during the first year of life. The author also followed up ten tuberculous women in whom pregnancy had been interrupted for the pulmonary condition and he found that three died within two years of the operation. Of the three patients with cardiac decompensation who were permitted to continue their pregnancy, two were well but one had many cardiac complications.

J. P. GREENHILL.

Couvelaire, A.: The Newborn Child of the Tuberculous Mother. Presse médicale 15: 225-227, 1927.

Since 1921, a special maternity pavilion for tuberculous mothers at the Baude-locque clinic has cared for 356 pregnant mothers; 357 fetuses or full-term children have been born. No therapeutic abortions have been performed, as Couvelaire does not feel that definite benefit can thereby be assured the mother. Three hundred and nineteen children were born living and apparently susceptible of being reared, though half of them had a birth weight of 3000 grams or less. These children were immediately separated from their mothers and were cared for in a special department, with all provisions against postnatal maternal contagion. Of these, 56 died during the first thirty days after birth; this loss is larger than that noted in general statistics of neonatal mortality. There has been a steady decline in the mortality rate. This improvement is ascribed to the isolation of and expert care for the babies, and to the use of human milk.

This mortality has been studied from two points of view: (1) the course of the disease in the mother during pregnancy, whether active, or of slow, chronic evolution; (2) the possibility of the placental transmission of the tuberculous virus.

Under the first heading he found that the initial loss (pregnancy, birth, and first three days of life) was 14 out of 41 for the active group, and 5 out of 85 for the second, or chronic, group. The higher fetal mortality of the first group is due to the larger number of spontaneous interruptions of pregnancy before term, under the influence of the maternal infection.

Under the second heading are noted some autopsy and experimental findings. Eight fetuses born dead or dying shortly after birth were autopsied, and guinea pigs were inoculated with suspensions and filtrates prepared from various organs and tissues. In two instances, both the autopsy and inoculation results were entirely negative. In 2 fetuses (2 of them from mothers dying of tuberculous meningitis), bacilli without demonstrable tuberculous lesions were found at autopsy in coronary and mesenteric lymph nodes and at the hilum of the liver. In 6 instances, guinea pig inoculation with tissue juices produced in some of the animals a few bacillary forms in scattered groups of lymph nodes. In two of these cases (one from a case of tuberculous meningitis in the mother), guinea pig inoculation with filtrates was followed by the development of acid-fast organisms in some lymph nodes. None of the guinea pigs presented the anatomic lesions of tuberculosis.

The author has noted that some children of tuberculous mothers, which were apparently normal at birth, have developed a "progressive denutrition" leading slowly to death. Autopsy of two of these infants disclosed no lesions of tuberculosis, but guinea pig inoculation resulted in a few scattered acid-fast bacilli. Such children are carriers of a tuberculous-virus which has been transmitted through the placenta, and in the early weeks of life leaves no discernible lesion. He has never seen a frank case of congenital tuberculosis, with lesions developed in utero.

The writer concludes that the mortality rate of these children during the first weeks of life is primarily determined by care and surroundings, and that under proper conditions, with protection from postnatal maternal infection, they can as a rule be reared as successfully as the children of healthy mothers cared for under similar conditions.

E. L. KING.

Fraymann, S.: Toxic and Mechanical Causes of Visual Disturbances During Pregnancy and Labor. *Monatschr. f. Geburtsh. u. Gynäk.* 76: 216, 1927.

Amaurosis can be the first manifestation of a severe toxemia. The author reports the only case on record of homonymous hemianopia during labor associated with eclampsia. The homonymous hemianopia in this case was due either to true hypertrophy of the hypophysis with an asymmetric sella turcica or to unilateral hemorrhage in the hypophysis accompanied by pressure on the right optic tract. Pregnancy should be terminated not only when toxic amaurosis is present but also when there is hemianopia. The author urges that more attention be paid to examinations of the eyes during pregnancy.

J. P. GREENHILL.

Springer, A.: Diabetes and Pregnancy. *Wien. klin. Wchnschr.* 38: 1108, 1925.

The author describes in detail two cases of pregnancy and labor in diabetic mothers in which the babies weighed 5250 and 7000 gm. respectively and draws attention to the fact that, although diabetics are as a rule sterile, when they conceive and carry to term, the fetus is usually of gigantic size. He agrees with Polliet that this gigantism is probably due to the maternal hyperglycemia. He cannot, however, explain the fact that 50 per cent of pregnancies in diabetic women terminate in early miscarriage or in premature labor.

RALPH A. REIS.

Faber, Knud: The Threshold of the Blood Sugar in the Glycosurias of Diabetics and of Pregnant Women. *La Presse Médicale*, p. 1109, Sept. 10, 1927.

The sugar threshold is constant for a given individual, diabetic or not, but it may vary notably in different individuals. In most diabetics the level is found between 150 and 230 mg. per 100 c.c. of blood. It is found between the same levels in some individuals having a normal carbohydrate metabolism without glycosuria, but in many such individuals it is lower. However, if the blood sugar level is between 100 and 150, a "cyclic alimentary glycosuria" is often found; if the level is lower, the elimination of sugar may be almost constant, the so-called renal glycosuria. A person with a very low threshold may be afflicted with a "diabetic anomaly of metabolism"; in this case the glycosuria is very hard to overcome, on account of the very low level at which the blood sugar must be kept.

The threshold of a given person may be modified under the influence of certain conditions; e.g., phloridzin glycosuria and the glycosuria of pregnancy. The latter often occurs in association with a normal glycemia, and the development of alimentary glycosuria has recently been advocated as a test of pregnancy; however, it is not sufficiently reliable to be of value.

The author decided to determine if the glycosuria of pregnancy is due exclusively to a lowering of the threshold, and if this is purely a temporary phenomenon. In two primiparae, both showing glycosuria during the day but free from it in the morning, he found the blood sugar levels before delivery to be between 95 and 131. Eight days after delivery it was 156 and 142, respectively. Two and seven months after delivery, respectively, the figures were 150 and 197, without

glycosuria. In the first patient, he also employed the alimentary glycosuria test before and after delivery, making blood sugar determinations and urinalyses every two to five minutes. He found that during pregnancy, after the administration of 25 gm. of glucose, glycosuria developed at the maximum figure of 132, and persisted until it fell to 52. After 15 gm. of glucose, no glycosuria developed. Eight hours after delivery, following the administration of 25 gm. of glucose, the blood sugar rose to 156 without glycosuria; however, 40 minutes after the maximum rise of the blood sugar a pronounced glycosuria was found. Six months later, after the administration of 100 gm. of glucose, the blood sugar rose to 197, without glycosuria.

The low blood sugar level of a fasting pregnant woman is especially to be noted, as well as the disappearance of the hypoglycemia after delivery.

E. L. KING.

Marsalek, Jan M.: A Case of Sudden Death During Pregnancy. Bratisle. lekar. listy. 7: 529, 1927.

A primipara, twenty-three years old, was admitted in deep coma. She was well developed, had previously been in good health. Her respirations were regular, deep and sonorous. A history was obtained, which stated that twelve hours previously she became dizzy and nauseated. She had frequent attacks of vomiting. She answered questions incoherently and seemed confused, then had several convulsions in rapid succession.

Examination showed head deviated to the left, face flushed, pulse 76, systolic pressure 120, râles in base of both lungs.

Uterus is four fingers below the xiphoid process, fetal position O. D. A.

The patellar reflexes were exaggerated, with a positive Babinski and Oppenheim sign on the right, and more marked on the left side. Ankle and patellar clonus could not be elicited.

Catheterized specimen contained no albumin; but considerable amount of sugar. Exitus occurred suddenly, three hours later.

At autopsy, a tumor, the size of a child's fist was found in the left cerebral hemisphere, which proved to be a very vascular gliosarcoma.

JOHN SOUKUP.

McIlroy, Louise A.: The Influence of Parturition Upon Insanity and Crime. The Lancet 214: 379, 1928.

In this medicolegal article the writer states that puerperal insanity accounts for 10 per cent of female lunacy, and in this group suicide and infanticide not infrequently occur. The crime may be committed in the puerperal period or during lactation.

The three chief forms of puerperal insanity are confusional, intermittent (manic-depressive) and dementia precox. Strains, exhaustion, infection, labor, or lactation may precipitate the mental state. The prognosis is poor in dementia precox. Not infrequently it may recur in following pregnancies and puerperiums.

The writer makes a plea for an adjustment and definition of the laws in England to prevent permanently branding the temporarily insane mothers for their rash acts, and yet to provide exacting punishment for sane infanticide crimes.

H. C. HESSELTINE.

Waldstein, E.: Status Epilepticus and Pregnancy. Monatsschr. f. Geburtsh. u. Gynäk. 78: 164, 1928.

The author reviews the literature on the association of epilepsy and pregnancy and describes a case of his own. In this case clinical studies as well as autopsy

definitely excluded eclampsia, the only case on record where the child remained alive. A cesarean section was done and the patient had no convulsions for thirty hours after the operation. Then she had convulsions which occurred at five to fifteen minute intervals until she died. In an interval of two and a half days she had 180 convulsions. Autopsy revealed as cause, six calcified cysticercuses situated over both cortexes and under the right frontal lobe. Among the 23 epileptic patients whose histories were reported there were 54 pregnancies. Forty gestations went to term, five ended prematurely and ten ended early as abortions. Hence it appears that epilepsy itself does not disturb pregnancy and, therefore, is no indication for therapeutic interruption of pregnancy. Gestation seldom makes epilepsy worse. In fact in half the cases an improvement was observed. Cesarean section is the best method of delivery.

J. P. GREENHILL.

Eufinger, H.: A Case of Transitory Delirium During Labor. *Med. Klin.* 22: 1107, 1926.

The psychic and somatic condition of a pregnant woman often borders on the pathologic and it is astonishing that mental disturbances do not occur more frequently during labor. Gestational psychoses have been reported quite often but there are few reported instances of transitory insanity during labor. In the latter cases, the immediate cause is the somatic and psychic trauma of labor but there must exist a psychopathic tendency. The author reports a case of temporary insanity during labor in a thirty-eight-year-old primipara. The family and past history of the patient revealed no abnormalities. After a forty hour labor and slow progress the patient was brought to the hospital. On admission she showed marked restlessness, disorientation and drowsiness. An attempt was made to hasten labor by means of a colpeurynter but the patient pulled the bag out of the uterus. After an unsuccessful attempt to deliver the child with forceps, a craniotomy was performed. Immediately after this, the patient became completely orientated. The patient's physician after delivery, said he had given the patient a hypodermic of scopolamine (0.3 mg.) before admission. In this case the delirium lasted one and one-half days.

J. P. GREENHILL.

Correspondence

The Classification of the Toxemias of Pregnancy

To the Editor.—Due to an error in transcribing notes a mistake occurred in my article in the July number of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY. On page 41, line 11, the phrase "edema universal in extent" should have read "absence of edema."

PHILIP F. WILLIAMS, M.D.

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